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THE DESERT BASINS OF THE COLORADO DELTA.

BY

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With Map by MR. GODFREY SYKES.

Attention has been focussed almost continuously upon the Salton Sea since the water of the Colorado River began pouring into it in the winter of 1904-1905, and numerous articles upon this newly reformed body of water have been written from the scene of the struggle of the engineers at the break in the river bank and from the point of view of the windows of passing cars. Announcements and counter-announcements have followed each other as to the genius, and as to the failures of the engineers in closing the break, and as to impossible rises and subsidences of the level of the lake. Many of the articles have appeared with footnotes inserted with the final proof, which recorded more recent whims of the flood, and which in effect nullified the fine-drawn conclusions as to engineering methods and wise prophecies of the authors as expressed in the body of the paper.

A moderate acquaintance with the resistless lash and play of the tongue of the current of this great river about its delta leads to extreme conservatism in predicting what it may not do. Some general features of the topography and drainage of the delta were described in this BULLETIN for January, 1906, and the discovery of a new flood-channel between the lower river and the Gulf of California was recorded on the accompanying map. A continuation of the investigation of the region has been carried out by expeditions from the Desert Laboratory of the Carnegie Institution, and a somewhat more comprehensive conception of the extent and nature of the delta in question is presented in the following pages.

The most recent expedition was made in February of the present

year, when the Salton Lake was circumnavigated from Mecca, California, as a starting-point, and an overland trip was made through the Pattie Basin, around the Cucopa Mountains, and through the delta lands near the main river-channel.

The delta, as ordinarily accepted, comprises the alluvial areas adjacent to the present channel of the river extending from a short distance above Yuma and spreading fanwise to the southward, where the river meets the Gulf. The deposition of this alluvial soil is believed to have resulted in cutting off the arm of the Gulf running northwestward far into California, which is ordinarily known as the Salton Basin, but which was designated as the Cahuilla Valley by Prof. W. P. Blake, a half century ago, in description of the general geological features of the region as found by him when engaged with the Williamson Expedition.

The depressed area to be included within the Cahuilla Valley may have been a marine body of water until the deposition of silt and the action of the tides closed the last channel and cut off direct communication between the Gulf and the depressed basin. Having been once cut off, the subsidence of the water in this Lake Cahuilla must have followed, as governed by evaporation and the inflow of river water. The bed was left as a great depressed basin, the bottom of which lay far below the barrier of mud that interposed between it and the waters of the Gulf. Into this basin at irregular intervals the main current of the Colorado has flowed at various times, filling it to a depth, perhaps, of 22 feet above mean tide-level as indicated by the ancient beach-line, and depositing here its burden of silt, and in effect making it a part of the alluvial-covered delta lands. The reversion of the river floods to channels running to the Gulf allowed the lake to recede by evaporation, leaving the salts carried in by the river water. Scores of times this must have been repeated. With each succeeding influx of water from the river, the deposited salts were dissolved, to be laid down again with the drying of the lake along with the increment brought in by the most recent inflow. Prof. R. H. Forbes, director of the Agricultural Experiment Station of Arizona, who has kindly undertaken the analysis of the waters collected by our expeditions, has called attention to the fact that the salts in the waters of the lake are in a combination which approximates more nearly a concentration of water from the Colorado River than it does sea-water. The repeated flooding of the basin has covered any sea-salt that may have been present with silt, and the deposits taken up by the floods entering the basin are those left there by previous evaporations.

AN.

Total
at 11
100

Sodium
Potass
Calcium
Magnesium
Aluminum
Iron, 1
Chlorine
Sulphur
Carbon
Silicic
Phosphorus

The exact source of all of the components is, however, not yet made out. The following table gives a detailed determination of a large sample of Salton water taken from over the region of greatest depth June 3, 1907, by Dr. W. H. Ross of the Agricultural Experiment Station of the University of Arizona:

ANALYSES OF WATER OF SALTON SEA AND OF COLORADO RIVER AT VARIOUS STAGES.

	Salton water, surface of deepest portion, June 3, 1907.	Colorado river water, low winter stage, Jan. 10-Mch. 26, 1900.	Colorado river water, rising summer stage from melting snow, Mch. 27-Apr. 30, 1900.	Colorado river water, summer flood from melting snow, May 1-June 29, 1900.	Colorado river water, low summer stage, June 30-Aug. 26, 1900.	Colorado river water, affected by local floods, Aug. 27-Oct. 1, 1900.	Colorado river water, summer floods from Arizona, Oct. 2-Nov. 10, 1900.	Colorado river water, low winter stage, Nov. 20-Jan. 4, 1901.
Total soluble solids at 110°C. Parts in 100,000.....	364.8	92.9	67.4	32.2	36.1	71.4	104.5	87.1
Complete analysis of soluble salts, stated by ions. Parts in 100,000.								
Sodium, Na	111.1	19.0	15.3	5.5	7.6	14.6	18.2	16.0
Potassium, K	2.3	1.1	2.1	1.0	1.3	1.8	2.1	1.2
Calcium, Ca	9.9	7.5	4.9	4.2	4.6	7.7	12.5	9.2
Magnesium, Mg	6.4	3.1	2.0	1.2	1.2	2.2	2.8	2.8
Aluminum, Al .....	.031	—	—	—	—	—	—	—
Iron, Fe .....	.005	—	—	—	—	—	—	—
Chlorine, Cl	169.7	20.5	13.9	4.5	6.9	15.8	17.5	18.1
Sulphuric, SO ₄	47.6	26.1	19.4	7.2	7.6	19.7	35.6	23.8
Carbonic, CO ₃	6.6	7.4	8.4	7.2	7.7	10.0	12.2	10.7
Silicic SiO ₃	1.2	4.6	2.1	2.1	3.3	2.3	2.2	2.1
Phosphoric, PO ₄ .....	.018	—	—	—	—	—	—	—

In communicating the above data, Professor Forbes comments as follows: "The determinations show a difference in character between the Colorado waters and the Salton water, which our previous partial analysis did not reveal. If you will compare Salton water with the Jan. 10-March 26 sample you will notice that the proportion of chlorine to soluble solids is 1:4½ in the Colorado water, while in the Salton water the proportion of chlorine to soluble solids is 1:2, which means that the proportion of salt is more than twice as great in Salton water.

"Also, comparing the same sample with reference to SO₄ you will see that in the sample of river water of Jan. 10-March 26 the proportion is 1:3½ of soluble solids, while in Salton water the proportion of SO₄ to soluble solids is 1:8, which is to say that the river water is proportionally stronger in sulphates than the Salton water.

"This makes it appear as if the soluble matters of Salton sea are not exclusively derived from the Colorado River. Either the surrounding mountains have contributed their modifying materials to the sink in times past, or certain separation changes have taken place in the salts which may have been at various times, more or less remote, laid down by the river, or these salts are in part derived from the sea. . . . The data on Salton water are not quite complete, but the essentials are all there. Dr. Ross is yet to make certain determinations of small quantities of nitrogen, organic matter, and perhaps lithium, which will not affect the general results given."

It is instructive to recall the fact that every thousand parts of sea-water contain about 34.40 parts by weight of mineral matter in solution, the principal components being represented by the following table:

Sodium chloride.....	77.758
Magnesium chloride.....	10.878
Magnesium sulphate.....	4.737
Calcium sulphate.....	3.600
Potassium sulphate.....	2.465
Magnesium bromide.....	.217
Calcium carbonate.....	.345

Total.....	100.000
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(Geology, Chamberlain and Salisbury, 1:309, 1904.)

As a result of inequalities of leaching action when the basin is empty, and of the rise of salts from below, the floor of the ancient lake shows loam, bearing alkali in varying proportions in different areas when dry; which, of course, constitutes an important factor in any agricultural consideration of the region. In the western portion clay forms the floor of the desert upon which in some places a thin layer of gravelly soil rests, while in other places the bare clay does not afford a foothold for plants of any kind.

The alluvial fan of Carrizo Creek comes down into the valley from the southwest, bringing great quantities of sand, which is piled up in dunes of the uncommon crescentic form. Similar formations occurring in the desert of Islay in Peru have recently been described by Professor Solon Bailey (*The Sand Dunes of the Desert of Islay*. *Ann. Astronom. Observ.*, Harvard College, 39; Pt. 2, 287, 1906), and lunar dunes in Seistan, Persia, are described by Sir Henry MacMahon (*Geographical Journal*, 28; No. 4, 333, 1906). Dunes of this form are supposed to be due to the action of a wind blowing

steadily in one direction, which in this instance is from the southwest. The Carrizo dunes are moving toward the bottom of the depression, which by the latest surveys is 286 feet below the sea-level. Lunar dunes also occur on the coast of California.

The tips of the crescent thin down to a few inches in thickness, and the central part of the half moon of sand is often as much as 15 or 20 feet in height, with a long gentle slope to windward, but dropping off as steeply as sand may be piled to leeward. The progress of these dunes results in disaster to plants covered by the heavier portions of the dunes, which move so slowly that death ensues before



FIG. 2.—FLOOR OF SALTON BASIN, 286 FEET BELOW SEA-LEVEL, WITH INCRUSTATION OF SALT. FEBRUARY, 1903.

the shoots are uncovered. Individuals which have been encroached upon by the thinner cusps, however, bend down under the slighter weight, and send up branches from lateral buds surviving until the dune has moved on.

The Carrizo slopes bear numerous seepages or slow springs of salty water; and as sand is moved along by the wind either loosely or in dunes, some of it is wetted and remains in place. The moist heap thus formed serves to anchor additional particles until a mound some feet high is formed which affords lodgment for a few shrubs, including a scraggly mesquite. The roots of these plants bind the sand together and the small colony of plants in this forma-

tion may survive for some time as a prominent feature of the landscape, visible for some distance. The seepage may decline or the sun may dry out and allow a portion of the sand to be moved by the wind, with the result that the whole dune may disintegrate with the death of all of the plants. Such dune formations, while intact, serve as a retreat for numerous desert rats and small rodents, and their burrows penetrate the mass of roots and sand in all directions.

The Cahuilla Valley, as part of the Colorado Desert, bears a characteristic xerophilous vegetation. Along the clay strata in an upper level, bands and groves of the California palm (*Neowashingtonia filifera*) form characteristic oases of striking aspect. At other places around the springs, which are generally alkaline, mesquite (*Prosopis*), salt grass (*Distichlis spicata*), the rare rush (*Juncus cooperi*), which here is to be found in great tufts, *Cyperus*, and *Scirpus olneyi* occur in abundance.

The salt bushes (*Atriplex canescens* and *A. Polycarpa*) grow on saline areas; but in places where the loam bears more than 3 per cent. of alkali but little is to be found besides *Allenrolfia* and *Sueda*, and these are generally in the shallow drainage-ways, from the soil of which some of the salts have been leached.

Parosela spinosa, one of the most striking of all desert shrubs, is to be found on the margins and in the beds of the dry streamways well up on the sides of the basin, and also *Gaertneria*, with its burr-like fruits. *Ephedra*, *Parkinsonia torreyana*, and *P. microphylla*, *Fouquieria splendens*, *Olneya tesota*, and *Yucca mohavensis* are also here in abundance, while the creosote bush shows its characteristic wide range of adaptability to a great variety of soils.

It is to be seen that most of these plants are of the halophytic, or of spinose types, while but few plants capable of water storage are present. Among these is an *Echinocactus*, *Opuntia Bigelovii*, *O. basilaris*, and *O. echinocarpa*.

The rainfall of the region does not exceed three inches annually, and very high temperatures are reported for various points within the basin.

An area of a few square miles at the bottom of the basin bore a heavy deposit of salt, which was collected and prepared for the market by the New Liverpool Salt Company, while the loam, sandy, and gravelly formations making up the sides of the basin were variously impregnated with salt and alkali. The water from the Colorado began pouring into the basin, early in 1905, and when its level was 273.5 feet below sea-level, or 12.5 feet above the bottom of the bowl, a gauge was established near the station of Salton, and the

succeeding rise as given by the Los Angeles *Times* for May 19, 1907, was as follows:

MONTHS.	1904.	1905.	1906.	1907.	TOTAL.
January .....	..	1.4	1.1	2.8	..
February .....	..	1.6	1.8	1.7	..
March .....	..	0.8	2.7	0.1	..
April .....	..	1.2	5.6	..	..
May .....	..	1.0	8.7	..	..
June .....	..	2.2	15.5	..	..
July .....	..	4.4	8.5	..	..
August .....	..	2.2	2.2	..	..
September .....	..	1.2	1.0	..	..
October .....	..	1.4	1.2	..	..
November	0.6	1.6	0.2	..	..
December	0.2	2.9	1.2	..	..
Total	0.8	21.9	50.0*	2.4*	72.1*

"A maximum depth [above gauge] of 72.2 feet was reached in February, 1907.

The receding of the water during November, 1906, was due to the temporary closing of the break in the Colorado River, and the evaporation from the lake surface."

The water thus poured into the basin began, of course, to take up the salts from the soil with great rapidity. Furthermore, the water spread out over the gentle gradients so rapidly, and with so little opportunity for general circulation, that a marked difference was found between the amount of salts carried in the shallower and deeper places. Thus on June 10th, 1906, when the greatest depth of the lake was between 40 and 50 feet, water $1\frac{1}{2}$ miles from shore near Mecca contained 401.6 parts of solid in 100,000, while at the same time a sample taken 100 feet from the shore showed 697.4 parts of solids. 1152.8 parts solids were found in a sample taken within a few feet from the shore near Travertine Point on May 23, when the margin was being pushed out over a saline flat. The currents set up by the summer winds and their facilitation by the increased depth led to greater uniformity within a short time, and on October 11, 363.2 parts in 100,000 were found in shallow water near the shore, while a half mile out a sample yielded 359.6 parts. This equalizing action continued so that in the first ten days of February, 1907, when the lake stood at its maximum, samples taken at various

* These footings should read: 49.7 4.6 77.0.

places yielded from 321.8 to 352. parts, showing a practical uniformity. The only marked departure from this general composition was to be found within a few miles of the mouths of the inpouring Alamo and New rivers, which at the time the samples were taken were bringing in only seepage water, the inflow from the break in the Colorado having been stopped (see 9 of table). The data bearing out these statements are given in the following table, kindly furnished by Prof. R. S. Forbes, Director of the Agricultural Experiment Station of Arizona, who has carried out extensive analyses of samples secured on the various Expeditions from the Desert Laboratory:

FEBRUARY, 1907.		Total Solids at 110° C.	Chlorine, stated as Na CO ₃ .	Hardness by Hebrus test, stated as Ca SO ₄ .	Sulphates by Ba SO ₄ , stated as SO ₄ .	Magnesia.	Lime.	Bicarbonates.	str. = strong. m. = moderate. w. = weak. — = none.
Sample.		Parts in 100,000.				Qualitative.			Remarks.
Salton Sea No. 1....	330.0	243.5	31.6	40.6	m.	str.	?	→	Samples 1-9 incl. are all of same general character. About ½ t. s. is Na Cl W. some lime and mag. as bicarb., but mostly as sulphate; and an excess of SO ₄ combined as Na SO ₄ .
" 2....	331.2	242.5	32.1	41.9	"	"	w.	"	
" 3....	336.0	249.0	35.0	42.2	w.	"	"	"	
" 4....	321.8	238.0	33.7	41.0	str.	"	"	"	
" 5....	330.4	242.0	28.3	41.9	"	"	"	"	
" 6....	327.0	240.0	29.9	42.3	"	"	"	"	
" 7....	336.6	246.0	28.8	41.3	"	"	"	"	
" 8....	338.4	249.0	28.3	43.7	m.	"	m.	"	
" 9....	258.8	185.0	27.2	35.8	w.	"	?	"	
" "A" surf.	338.2	250.0	30.5	41.8	str.	"	w.	"	
" "A" 10' ..	338.6	250.0	27.7	42.3	"	"	"	"	→ All this set of same general character as 1-8, showing very little influence of depth on samples.
" "A" 30' ..	340.0	250.0	27.2	42.2	"	"	"	"	
" "B" surf.	341.8	250.5	28.3	42.4	"	"	"	"	
" "B" 10' ..	338.6	250.0	33.2	41.7	"	"	"	"	
" "B" 60' ..	352.0	259.0	36.0	44.1	"	"	"	"	

The main and maximum level beach-line of the ancient lake is well marked more than three-fourths of the way around the basin; but of much greater interest are the numerous minor beaches, which may be traced with ease on the steep western slope of the basin near Travertine Point. These are denoted by denser belts of vegetation (see Figure 5), from which it is evident that the water has stood at various levels for lengthy periods at various times. It is not to be taken for granted that these beaches represent one series of successive levels in the recession of the water from the maximum size. It is more probable that they attest the height of various fillings, like the one now under observation.

According to present observations, the minor beaches are best traced by vegetation on steep, gravelly slopes. When the water

stands at any level for even a brief period, the action of the waves results in a caving bank being formed. Immediately at the foot of this bank the water exercises a sorting action, so that when the lake recedes from this level it leaves behind a vertical crumbling bank of gravel, a zone just below it in which the coarser and finer material have been separated, and in which drift and, perhaps, seeds have been lodged. It is evident that with this beginning a difference in the occurrence and distribution of plants reoccupying the submerged area might be noticeable after the lapse of many centuries.

The present level of the Salton gives it a superficial area of be-



FIG. 3.—MARGIN OF SALTON SEA NEAR TRAVERTINE POINT, MAY 22, 1907: LEVEL RISING RAPIDLY.

tween 600 and 700 square miles. The area flooded was occupied with halophytic plants around the saline springs and salty areas and of spinose forms in the drier areas. The recession of the lake will doubtless be followed by a reoccupation of the basin by these two forms of vegetation. Many of the deserts of the world comprise extensive areas formerly in submergence.

The recession of the Salton Lake, therefore, will afford the botanist an unparalleled opportunity for the observation of the movements and behaviour of plants in the occupation of a denuded area, which should afford distributional data of prime importance, and

may also yield facts of great importance in the study of the physiological adaptations of xerophytic and halophytic plants.

Such an investigation has been undertaken by the Desert Laboratory of the Carnegie Institution, and observational areas have been surveyed on the present shore, which will be extended as the lake recedes down to the bottom of the bowl. One such area lies on the gentle slopes of alkaline loam near Old Beach, another in the mesquite-covered flats near Mecca, another includes a sand wash and adjacent banks, and another is located on the gravel slopes on which the old beaches are so plainly recorded. One of the most interesting comprises Obsidian Island, off the shore from Old Beach, in



FIG. 4.—DESERT WASH, INVADDED BY AN ARM OF THE SALTON SEA. FEBRUARY, 1907.

which it is proposed to follow the course of events in the enlarging area of the island, and to note the result of the laying bare of the neck of land connecting with the shore of the lake. In addition to the movements of the vegetation now established in the basin, it seems a fair probability that plants and seeds brought down by the Colorado current may find lodgment on the moist shores and become established under conditions slightly different from those of the habitat from which they came.

The actual margin of the lake presented a very singular aspect at the time of the recent expedition, since no real beach existed. The

advancing waters encroached upon the desert vegetation in such manner that, within a few feet of the shore, growth was continuing as usual. Some shrubs stood with their feet in the water, while others ran farther out in a series which showed less and less of the tops, until perhaps a half mile from the shore one might steer through the submerged tops of mesquite and *Parosela* soaking in the salty water. The dry washes that come down the sides of the bowl cut shallow *barrancas* with vertical walls and broad floors, in which shrubs and herbs become established in the long intervals between the occurrences of running water in these drainage-ways.

The *salses*, or mud volcanoes, which lie near these small buttes were all covered at the time of our visit and nothing of their activity could be detected. Dr. Veatch visited the place in July, 1857, and by his account the active vents occupied a parallelogram five hundred by three hundred and fifty yards, the mud, steam and water escaping with such force that they were thrown many feet into the air with noises that could be heard for several miles (Veatch, J. A. Notes on a visit to the "Mud Volcanoes in the Colorado Desert in the month of July, 1857, Am. Jour. Science and Arts, 2d Ser., 26:288, 1858. See also Le Conte: An Account of Some Volcanic Springs in the Desert of Colorado in Southern California. Amer. Jour. Science and Arts, 2d Ser., 19:1, 1855).

Long tongues of water extended up these *barrancas*, sometimes to a distance of a quarter of a mile or more from the general shoreline, and in these the roll of the lake was converted into oscillations of rising, advancing currents, which would set upstream for several minutes and then reverse, leaving a long stretch of moist soil or mud.

Several small volcanic hills of ancient origin occur in the basin southwest from Old Beach, and these have been cut off by a sheet of water with a depth of about 30 feet. The soil is highly alkaline, the slopes show minor beaches, and the restricted vegetation was supporting a few rabbits at the time of our visit, and these in turn were being preyed upon by a coyote and raccoons.

Observations upon the relative humidity were during the course of a camp on shore among the sand dunes of Carrizo creek. Within a narrow zone, 4 or 500 yards in width, fringing the shore a relative humidity between 80 and 90 per cent. was found on the afternoon of a day without wind. Outside of this the proportion decreased rapidly, so that at a thousand yards but 49 per cent. was observed; beyond which the unchanged aridity of the desert was soon encountered. The maintenance of the lake at any given level for two

or three years would doubtless result in a zone of shrubs and other vegetation near the shore, resulting from the abundant supply of moisture; but little influence may be noted beyond this. Conditions of relative humidity on the desert at the eastern margin of the moist delta were described in the last article upon this region (BULL. Amer. Geog. Soc., January, 1906, p. 4). To predicate any further change in the Colorado Desert, either in climate or vegetation, as the result of the formation of the lake, is to make assertions not in consonance with existing facts, nor in harmony with the theoretical conditions.

A second depressed basin formerly connected with the Gulf lies to the south of the Salton across the international boundary, between the Cucupa Mountains and the main range of the peninsula of Cali-



FIG. 5.—TERRACE OF ANCIENT BEACH ON THE RIGHT AND SALTON SEA AT MAXIMUM LEVEL. FEBRUARY, 1907. MINOR BEACH LINES ARE INDICATED ON THE GRAVELLY SLOPES BY BANDS OF VEGETATION.

fornia. But little systematic information upon it may be found, although an intermittent salt lake in it has long been known under the name of Laguna Maquata.

Brief mention was made of this region in a previous paper (The Delta of the Rio Colorado, BULL. Amer. Geog. Soc., January, 1906), the inflowing waters of the delta having been noted from the summit of the Cucupa Mountains in April, 1905. Our recent expedition outfitted at Calexico, and traversed a route to the westward across the northern end of the Cucupa Mountains, through a pass south of Signal Mountain, and southward, along the eastern side of the basin, doubling around the southern end of the mountains, and coming northward through the delta over ground previously examined by us.

The data obtained in this manner are of unusual interest, since it is indubitably proved that this basin is also an ancient arm of the Gulf, from which it has been cut off more recently, and that it now, like the Salton, is an integral part of the delta. Furthermore, the lake within it is re-filled at intervals, much more frequently than the Salton, while at times the bottom of the basin is left bare. Briefly expressed, it is repeating the history of the last named, and is now in the condition which might reasonably be ascribed to the Salton a few thousand years ago.

This basin, which for reasons given below we have designated as the Pattie Basin, lies nearer the Gulf, and has a more direct connection with the drainage of the delta, and, as will be seen, has not yet



FIG. 6.—CRESCENTIC DUNES IN THE SANDS OF CARRIZO CREEK.

developed the connecting channels, which have formed such an important feature in the flooding of the Salton.

The flood waters of the delta bathe the entire eastern base of the southern half of the Cucupa Mountains, locally known as the Mayor, and the collecting channel, the Hardy River, comes against the granite rock about midway of the region of the contact (see map). Ordinarily this stream, which issues from Volcano Lake, carries the seepage from the alluvial soil and the feeble flow from the lake, but during high water all of the flow of the western part of the delta is collected by it, as it thrusts an elbow against the mountain. Turning to the southeastward toward the Colorado, a great volume of water leaves it in various low places along the ridgy bank and slips

gently to the southward, collecting in an open *laguna* two or three miles from the main channel. No great depth is attained except in shallow depressions that have been cut in the loam by the current, and the level of the flood may be seen on the stems of the mesquite, which forms dense jungles over most of the delta and upon the rocky foot of the mountain. The inundation begins ordinarily in late May or early in June, and lasts two months or more—a sufficient time to cause the mesquite to form prop roots, which emerge from the hard stems two or three feet from the ground and attain a thickness of half an inch in some instances; an action by no means common with this tree.

The jungle formation of mesquite and other shrubs does not extend to the southern end of the mountains, and the flood waters emerge from it and spread out over a great saline plain which extends far to the southward along the Colorado and the head of the Gulf, and which, in fact, is a portion of the delta. A high-water channel leaves the Hardy before it reaches the Colorado and makes around southward and eastward through this plain, returning to the river at some distance below.

The western extension of this great plain runs between the southern end of the Cucopas and the coastal ranges, a width of 12 to 15 miles, and curves northward around the western side of the Cucopa Mountains.

The course of the water indicates that from near the southern end of the Cucopa Mountains the slope is northward. Alkaline moist spots are seen in places when the plain is dry, whitish saline deposits in others, and extensive stretches of caked surface are found with a shallow rhomboidal cleavage. During floods the water following the gradient in a shallow sheet ten to twelve miles wide, with a depth of only a few inches or two or three feet at most, becomes highly heated in the rays of the vertical sun, as it moves slowly northward. West of the Mayor it encounters a zone of short sedge, two or three miles in width, apparently extending from mountain to mountain. Next a series of channels is encountered, which run athwart the plain and head in toward the base of the Mayor. These channels are cut to various depths as great as 15 or 20 feet, are extremely tortuous, and, although the drainage is of the indefinite character that might be expected under the conditions, they finally form one large channel leading northwesterly toward the base of the peninsular range. The slowly moving flood waters fill the main system, and overflow the plain on both sides, eroding parallel troughs, or channels of indefinite length, many of which

begin and end blindly. The whole series are known to the Indians as Las Barrancas.

The accumulated water forms a lake about forty miles in length and twenty in width, which extends from the Cucopa Mountains on the east to the base of the main range on the west at its highest level, and has long been known as Laguna Maquata by the Indians and Laguna Salada by the Mexicans. It is to be seen that here is a condition of affairs very similar to that in the Salton Basin. According to the testimony of Mr. H. A. Jenkins, a cattle man of some experience in the delta, this system of barrancas has nearly doubled its length within the last ten years, within which time it has developed the upper course and the branches, shown on the map accompanying this article. It is fair to presume that if a canal were cut from the Hardy channel to the head of one of these branches, the action of the flood waters during the next overflow would bring about results fairly similar to those which have come about in the Salton during the last three years, following the opening of the river bank and the excavation of canals connecting its channel with that of the Alamo. The slope is hardly so steep as in the Salton, however, and the action would probably not be so rapid.

The winter floods of 1905-1906, which sent such enormous volumes into the Salton, also filled the Laguna Maquata to a high level, and this had receded at such a rate that at the time of our visit it had less than a third of its recent maximum area. Another year or two without accession from the delta and its floor would again be dry, as it has been seen to be on more than one occasion.

Observational records concerning the movements of the Laguna are very sparse. Mr. C. R. Orcutt reported (*The Colorado Desert*, Tenth Rep. State Mineralogist of Calif., 1890) that it was of great size in 1884, at which time great volumes of water passed through New River to the Salton. The Laguna had dwindled to a chain of salt pools in February, 1890, although it might have filled and receded between these two dates, and was also very low and salty in 1892. It is not known whether or not it filled in 1891, at which time Salton received much water from the river. According to information furnished by Mr. H. H. Silsbee, who has conducted extensive surveys in the delta lands, the Laguna filled again in 1893. An outflow from the Hardy passing around the southern end of the mountains into the Laguna was reported in June, 1907; and this probably occurs during almost every annual flood. A consideration of these and of the general conditions leads to the belief that the Laguna and Salton receive water from the river quite independently of any com-

mon cause, except that of a flood in the Colorado, which may enter one or both, according to various factors affecting the flow.

When filled to its maximum level, the waters stand several feet deep against the steep, impassable granite walls of the mountains on both eastern and western shores, and at such times the basin is, of course, impassable. The drying up of the lake, however, leaves its floor as great stretches of smooth, hard saline surfaces, furnishing unexcelled waggonways, and over this extensive smuggling operations have been conducted at times. A line of communication known as the Campo road passes through the basin, but has been a possible

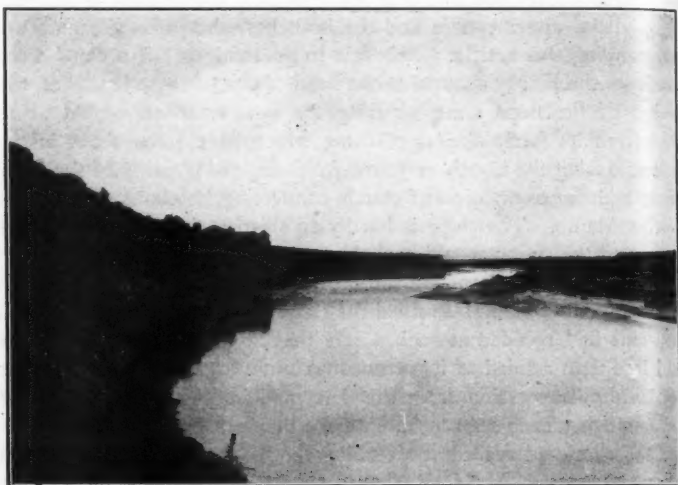


FIG. 7.—CHANNEL OF NEW RIVER AT THE INTERNATIONAL BOUNDARY. MEXICALA FORMERLY OCCUPIED A SITE OVER THE MIDDLE OF THE CHANNEL, AND REMAINING BUILDINGS ARE TO BE SEEN ON BANK AT THE LEFT.

route at low water for the infrequent prospector, rather than a used thoroughfare.

At the time of the recent visit to the lake the level was many feet below that reached during the inflow of a year ago, and on the gentler slopes the shore was fringed with a muddy zone as much as half a mile wide in places, which rendered it impossible to reach the water. Near the upper edge of this band of salty mud was a windrow of remains of fish, which appeared to be carp, according to the results of an examination by Mr. Herbert Brown of the party. This low ridge of dead fish was seen to extend for about fifteen miles, and may have been double that length. A similar observation was

made by Orcutt in 1890, who found that the remains at that time were of mullet. From other reports it seems fairly probable that nearly every flood brings in with it shoals of fish which find their way into the Laguna. The shallow sheet coming in over the plain to the southward must furnish abundant food; but as the water rises in temperature and increases in concentration, it seems quite probable that a point is reached at which the waters become poisonous to all of the finny inhabitants. Furthermore, this condition ensues at once and with sweeping effect, for the dead fish go ashore during so brief a period that no marked change of level has taken place;

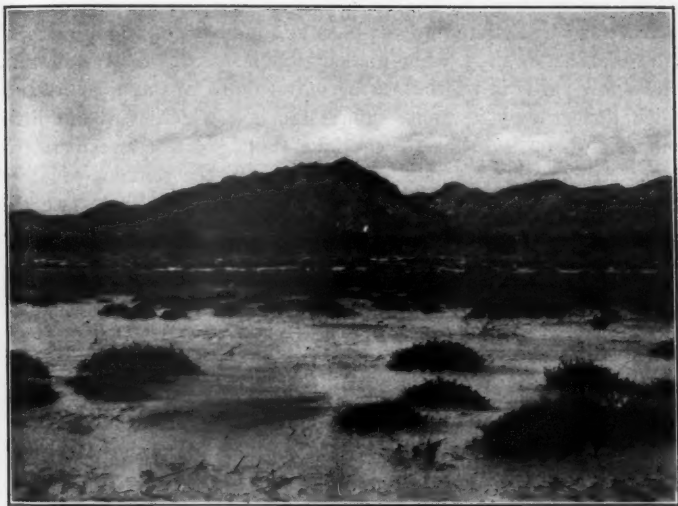


FIG. 8.—FOREBEACH OF LAGUNA MAQUATA, WITH BELT OF MESQUITE IN THE BACKGROUND AT HIGHEST BEACH-LINE. CUCOPA MOUNTAINS IN THE BACKGROUND.

and as evaporation may be as great as a half-inch a day, and is scarcely ever less than a quarter, the disaster must take place within a week or two. In February, 1907, the Laguna contained 10548.8 parts of salts to every hundred thousand, and crystals of Calcium sulphate were being formed along the margin (see table).

A length of seven or eight miles of the lower part of the channel of the main barranca contained water which was extremely highly charged at the upper southern end and contained 742.2 parts in 100,000 two or three miles below; while Mr. H. A. Jenkins reported that it was generally found to be drinkable at the extreme lower end, which would imply the presence of less than 250 parts in

100,000. The only plausible explanation that could be offered was that the highly-charged saline soils of the plain were covered with silt in the lower portions of the barranca, and that the water remaining there was thus kept sweet. Mullet and carp were found in the channel visited.

The best evidence as to the movements of the lake-level was that afforded by the vegetation surrounding the main body of water. The extreme high-water mark during the present condition of the basin is denoted by a zone of mesquite a quarter to a half mile wide, which runs around the lake, being interrupted only where the shore comes against the granite or volcanic slopes. Inside the mesquite was a narrower zone inhabited by salt-bush and mallows, marking possible levels of 1884, or 1893, while immediately inside of this was another zone a few yards in width, bearing only clumps of the sea-purslane, which thrives only in moist saline soil, and which with but little doubt stands on the shore of the lake at its greatest level in 1905-1906. Among these clumps were to be seen the remains of other desert plants which had become established at this level since the previous inundation. These formations were remarked with extreme interest, since similar zonation, with consequent succession, may be expected in the long periods of rise and recession of the Salton.

Sample.	Parts in 100,000.				Qualitative.				Remarks.
	Total Solids at 110° C.	Chlorine, stated as Na Cl.	Hardness by Heburn test, stated as Ca SO ₄ .	Sulphate by Ba SO ₄ stated as SO ₄ .	Ma.nesia.	Line.	Bicarbonates.	str. = strong. m. = moderate. w. = weak. - = none.	
Pozo Coyote...	245.0	136.5	Na ₂ CO ₃ 36.5 Ca SO ₄	30.7	?	w.	w.	→	Characteristic black alkaline. (Seepage from granitic country.) Also H ₂ S; no Li or K * no H ₂ S or K; Li slight † Strong H ₂ S; silt. Li & K ‡
Barranca.....	742.2	550.0	111.4	110.7	str.	str.	"	→	
Hot Springs....	2480.0	2196.0	522.2	32.2	w.	"	"	→	
Maquata	10548.8	8570.0	87.0	975.2	str.	"	str.	→	

* About the same relative composition as 1-3 but concentrated \mp $2\frac{1}{2}$ times.

† Deficient in SO₄ and Mg, but with great hardness due to Ca Cl₂; \mp .5% w. \mp 2% Na Cl.

‡ Showing a greater proportion of salt and a lesser proportion of sulphates as if Ca SO₄ might have been pointed out, leaving Na Cl and Na₂ SO₄; and the salt deposit from edge of lake is found to be mainly Ca SO₄.

→ Lithium in lake apparently derived from hot spring.

Midway of the eastern margin of the lake at its level, the expedition encountered a spring, the waters of which gave temperatures

112° F. to 128° F. when tested with two reliable thermometers. The steaming pools were sheeted with an algal formation consisting of *Phormidium tenue*, and a second species of the same genus to be named *Phormidium tenuissimum*, the latter being identical with a species in the hot springs of Yellowstone Park, according to Professor Setchell of the University of California, to whom they were submitted for examination. Darting around among these blue-green masses were numbers of a small fish which reminded the novice of a trout. The waters were so warm that the hands could not be held under the surface very long; but finally a few of these were captured, and, to our astonishment, remained alive when kept in camp in a vessel of the spring water, which soon fell to air-temperatures of 80° and down to 50° F. Furthermore, when placed in formalin, they were highly resistant to its action. Some of these specimens submitted to Dr. D. S. Jordan were found to belong to an undescribed species of rainwater fish, and were accordingly named *Lucania Brownii* by him. The capacity for endurance of these animals to external factors may be realized when reference is made to the composition of the water as shown in table, page 722. Still more interesting is the fact, to which my attention has been called by Dr. B. W. Evermann of the U. S. Fish Commission, that in this spring is the only known occurrence of a rainwater fish in the Pacific drainage.

As soon as the status of this valley was realized by the members of our expedition, it was determined to designate it as the Pattie Basin, in recognition of the first recorded visit to the place by the Patties, father and son, with their party in 1828. This party of trappers descended from Yuma in an effort to reach the Spanish settlements to the southwest, and, after some struggles with the floods and tides at the mouth of the river, cached their extensive store of furs and started westward from the main channel, traversing the mesquite jungles of the delta lands and crossed the Cucupa Mountains, probably at some pass in the Sulphur Mine Range, the lower central series of ridges, and then made across the basin in a two-days' march to Palomar Canoñ, or Agua Caliente, coming down from the peninsular ranges. The mission of Santa Catarina was reached first, and from thence they were taken as prisoners to San Diego. Whatever doubt may be held as to the accuracy of the account of the wanderings of this party from Yuma northward, it is to be said that the description of the journey from the Colorado River to the mountains of Baja California is well in accord with the facts as we have found them, and the hardships of the journey across the Pattie Basin are portrayed in a manner impossible to any one

who has not actually experienced its rigours (The Personal Narrative of J. O. Pattie, 208-228, 1905). It is by no means improbable that some portion of the basin or its laguna may have been glimpsed by Father Kino two centuries ago; but no direct evidence is at hand, and many easier and more profitable routes are offered in the extensive missionary work carried on by him with such vigour. The map by Font in 1777 shows an arm which might well mean the extension of the delta waters into this basin (see Fig. 11). Father Garcés, on his fifth visit to this region in 1775 and 1776, undoubtedly made as far south as the mud flats south and west of Montague Island, and in so doing saw the great open plain leading into the basin. He says:

Thus I perceive that at time of the great risings of the river the water can very well overflow this valley or strand that there is between the two sierras of Santa Barbara (Cucopa Mts.) and of San Gerónimo (the main range south and west of the Cucopa Mts.) as far as the place where the first expedition [of 1774] found stranded that heap of fish of which is made mention in the diary (The Diary and Itinerary of Francisco Garcés, by Elliot Coues, 1:194, 1900).

The diary has not been accessible, but this last paragraph indicates that a passage had been made through the Pattie Basin when the water in the Laguna was at a low stage and that remains of fish similar to those mentioned above were found.

It is to be noted that the unfamiliarity of the editor of Garcés' Diary with the features of the lower delta has led him to persistently deny the correctness of the positions given by this Spanish pioneer. Garcés' route may be traced with ease on the map accompanying this article to a point as far south as Antelope Slough, where, finding only bare flats and no drinkable water, he turned north.

The Cucopa Indians who have inhabited the lower part of the delta about the mouth of the Hardy for some time, singularly enough, hold the closest communication and intermarry with the tribes inhabiting the mountains to the westward of the basin. Two main trails are used. One crosses the Cucopa Mountains in the vicinity of the Borrego Peak, going up from the delta through a long cañon heading toward the southwest. Agua de las Palmas is the first watering-place, and this spring is reputed to be named from the group of palms which surround it, probably the only plants of this kind in the whole range, although Barrows mistakenly ascribes to them a wide distribution in this region (National Geog. Magazine, 11, 347, 1900). The main ridge is crossed through a low pass, and then the way leads through granite, volcanic and clay ridges to where, among the bad lands, a seepage in a sand wash, known as Agua de las Mujeres, furnishes a small but unfailing supply. From here a blind trail leads, straight as may be, due west across the

valley to the mouth of the Palomar Cañon, up which, at a distance of about three miles, running water and the grateful shade of groves of palms may be encountered. This has long been a favourite camp and meeting-place for the Indians, and one of the attractions of the place is the quantity of agave, growing on the slopes, from which mescal is baked and brewed.

The trail from Agua de las Mujeres to Palomar Cañon passes to



FIG. 9.—REGION AROUND THE MOUTH OF THE COLORADO RIVER, SHOWING TWO CHANNELS.
BY GUILLAUME DE L'ISLE. CARTE D'AMÉRIQUE, PARIS, 1722.

the south of Laguna Maquata, and it makes a distance of about 30 miles across a desert plain, baking in the vertical rays of a tropical sun. The route is found entirely by directions or ranges on somewhat indefinite topographical features, and it requires experience and a stout heart to dare the journey in midsummer. The great sheet of the flood which fills the Laguna at times moves across a

section of this trail several miles in length, covering it to a depth of a few inches or a few feet, and a passage might be made by a horse-man at such times. In one instance a Mexican prospector out of provisions, made it afoot, feeling his way cautiously over the slippery muddy bottom so slowly that two days and the intervening nights were consumed in reaching Agua de las Mujeres. The hot, salty water underfoot, the blazing sun, clouds of mosquitoes and insects, together with an insufficient supply of water in his small canteen, formed a combination that tested his powers of endurance to the uttermost.

The second intertribal trail starts from near the point where the flood waters leave the channel of the Hardy and climbs over the southeastern spur of the Cucopa Mountains, descending to Pozo Coyote due south of the main range. Here water containing black alkali is found, and, when used constantly, the proportion present is less than one-fourth of one per cent., but when allowed to stand and evaporate the percentage rises to an injurious figure. From Pozo Coyote the trail runs across the bare, flat plain in its upper slope, where the water starts northward to Laguna Maquata in times of flood and makes either to a *tinaja* at the northern end of a series of small mountains, known as the Tinaja Range, or up a wide valley farther to the southward, Arroyo Grande. This latter route is one much traversed by Indians and Mexicans, as it affords the easiest grades from the backbone of the peninsula to the Colorado River, and is composed of short tangents from water to water. Our expedition, which traversed the eastern side of the Pattie Basin, found permanent water supply only at Agua de las Mujeres. North of this, about twelve miles, a deep *cajon* which cut down through a foothill of red conglomerate had a number of kettle holes, or *tinajas*, which contained water at that time, but these could not be relied upon in times of great aridity. The contents of Las Barrancas were used sparingly by our horses, but were too concentrated to allay thirst. Pozo del Coyote offers an unfailing supply, but if not visited by any traveller for two weeks it becomes poisonous. Thus it may be seen that but one reliable source of water is to be found on all of the western slopes of the Cucopa Mountains.

The information obtained by our various examinations of the region shows that the area to be included in the delta is much more extensive than ordinarily supposed. In addition to the alluvial lands near and below Yuma, extending to the mouth of the river, the triangular tract subject to overflow east of the mouth, including the channel of the Santa Clara Slough and extending as far south in

Sonora as $31^{\circ} 45'$ N., is an integral part of the land made by the river. The Salton Basin, extending 180 miles northwest from the river, the Pattie Basin, curving around from below the mouth of the Hardy up to near the international boundary, and also the alluvial plain on the western shore of the Gulf as far south as $31^{\circ} 15'$ N., are to be included.

This plain has not previously been considered as a portion of the



FIG. 10.—LOWER CALIFORNIA AS AN ISLAND. BY M. BURG, IN "A NEW MAP OF NORTH AMERICA," OXFORD (PROBABLY ABOUT 1700).

delta; but it is made up of river deposits, is traversed by flood channels which leave the Hardy near its junction with the Colorado, and much of the surface bears drift brought down from the upper course of the river.

The difficulties of travel in all of the delta may well be taken to account for the diversity shown by the earlier maps of the head of the Gulf. Some of the curious branches shown on the old maps

might be taken to indicate that the Laguna Maquata or the Salton Sea had been noted by the explorer. The wide expanse leading around between two great mountain ranges into the Pattie Basin might well justify the observer from the Gulf in the belief in the Strait of Anian, and this belief would be strengthened if his route led him to encounter the waters of the Salton a hundred miles to the northwest.

Something of the outflow channels of the Colorado in the delta is shown on a Spanish map of a century ago, as illustrated in the portion reproduced in Figure 11. The channel curving to the westward

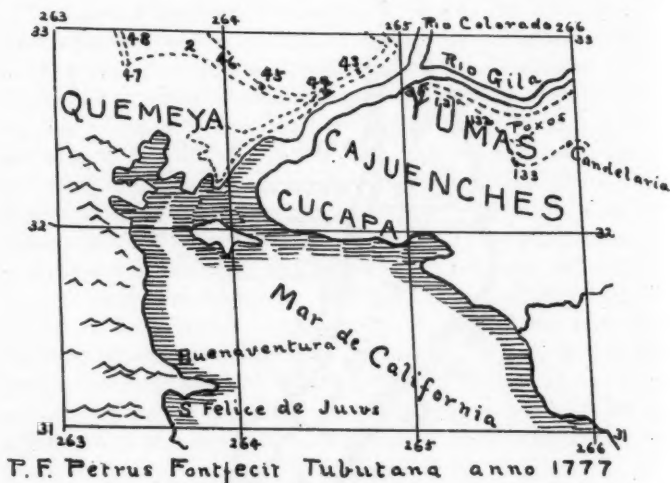


FIG. 11.—MAP OF THE HEAD OF THE GULF OF CALIFORNIA BY FONT, 1777, IN WHICH AN ARM IS SHOWN WHICH MIGHT HAVE OCCUPIED THE PATTIE BASIN.

would represent the system of the Pescadero and Hardy of the present time, although it is to be noted that all of such channels might change form and position in the most radical manner in a few decades.

The study of the origin and movements of the flora of this region, which has been undertaken by the staff of the Desert Laboratory, entails a consideration of the more recent geological history, together with the present features of importance to vegetation.

The Gulf originally divided into three main branches at its upper end, and into their narrowing straits the tides have always piled up to heights which at present reach over 30 feet. The river emptied into one of the arms, and the silt piled up and moved by tides and

currents, together with possible changes of level, has filled up one arm to form the low lands near the present course of the channel, and made a barrier across the inlets leading into the two other arms, which, now arid and intermittently flooded from the river, form the Pattie and Salton Basins.

In addition to the slow movement of the jungle vegetation seaward with the southern extension of the central portion of the alluvial lands, other major movements of great sweep have taken place. The depressed basins, once a part of the Gulf, have been occupied by various types of xerophytic and halophytic vegetation, by encroachment from the contiguous desert, and by the aid of the inflowing river floods from great distances, and many opportunities have been offered for the origin and adaptation of new species either by direct response or by the chance saltation, which might bring a new form into existence in an environment exactly suitable for its maintenance.

The Cucupa Mountains are in effect a desert range, connected with other high land by a narrow ridge crossing the international boundary, and their arid slopes on the other hand offer conditions of almost absolute isolation, being cut off from the mainland of Sonora and Baja California by low basins and moist alluvial plains, and offering conditions favouring endemism. We thus have a desert island in the midst of a great area in which the distributional movements of vegetation have been of unusually wide amplitude and the possible interchanges of living organisms have been of an exceptional character.

LETCORTH PARK PRESENTED TO NEW YORK STATE.

Governor Hughes, in his inaugural message to the Legislature of New York on Jan. 2, 1907, made the following communication:

It is my privilege to lay before you the public-spirited proposal of the Hon. William Pryor Letcworth to convey to the people of the State of New York 1,000 acres, approximately, situated in the town of Genesee Falls, Wyoming County, and the town of Portage, Livingston County, upon which Mr. Letcworth now resides.

He desires to dedicate the land to the purposes of a public park or reservation, subject to his life use and tenancy, and his right to make changes and improvements thereon. If it is your pleasure to provide for the acceptance of the gift, the State will thus obtain title to a tract of rare beauty, the preservation of which, for the purposes of a public park, cannot fail to contribute to the advantage and enjoyment of the people.

Late in the same month an Act accepting the gift was passed, and became the first law of Gov. Hughes' administration. It is provided

that the American Scenic and Historic Preservation Society, after the death of the grantor, shall have control of the property for the purposes of a public park.

The Twelfth Annual Report (1907) of the American Scenic and Historic Preservation Society contains an article by Edward H. Hall, Secretary of the Society, giving a biographical sketch of the munificent donor, describing the park, and telling the geological story of the Genesee River, and of the wonderful cañon through which it flows, the most beautiful part of which is included in the park.

The facts given below are condensed, by the courtesy of Mr. Hall, from his attractive article. The J. B. Lyon Company, State Printers, Albany, kindly lent to the BULLETIN some of the illustrations which appeared with Mr. Hall's paper.

Mr. Letchworth has long been a conspicuous and public-spirited citizen of New York who for many years has devoted himself chiefly to charitable work. His service to the State in this direction has been notable. He was a member of The State Board of Charities for twenty-four years, and gave nearly all of his time to his official duties.

In 1859 he began to acquire the property at Glen Iris on the Genesee River which he has now presented to the State. He realized that, to protect the commanding beauty of the place, he must increase his acquisitions so as to take in both banks of the gorge. He therefore kept on buying until he had acquired about 1,000 acres stretching along both sides of the river for about three miles and including all three of the Portage Falls. The property has long been regarded in New York as second in beauty and interest only to Niagara Falls.

Mr. Letchworth has expended about a half-million dollars on the estate, which embraces both forest and farm lands. The great diversity of its topography has made it the habitat of a remarkable variety of flora and fauna. In improving the property, Mr. Letchworth has been so successful in preserving the natural conditions that the native growths and inhabitants still find congenial surroundings and continue to occupy their old haunts. George W. Clinton, president of the Society of Natural Sciences of Buffalo, says that a greater variety of plant life can be found there than in any other locality of which he has knowledge. Eldredge E. Fish, the naturalist, writes: "In many respects this charming retreat surpasses any other in its attractions for the naturalist. The flora is more abundant and varied, while the song birds are here in greater numbers than in any other locality in the state."



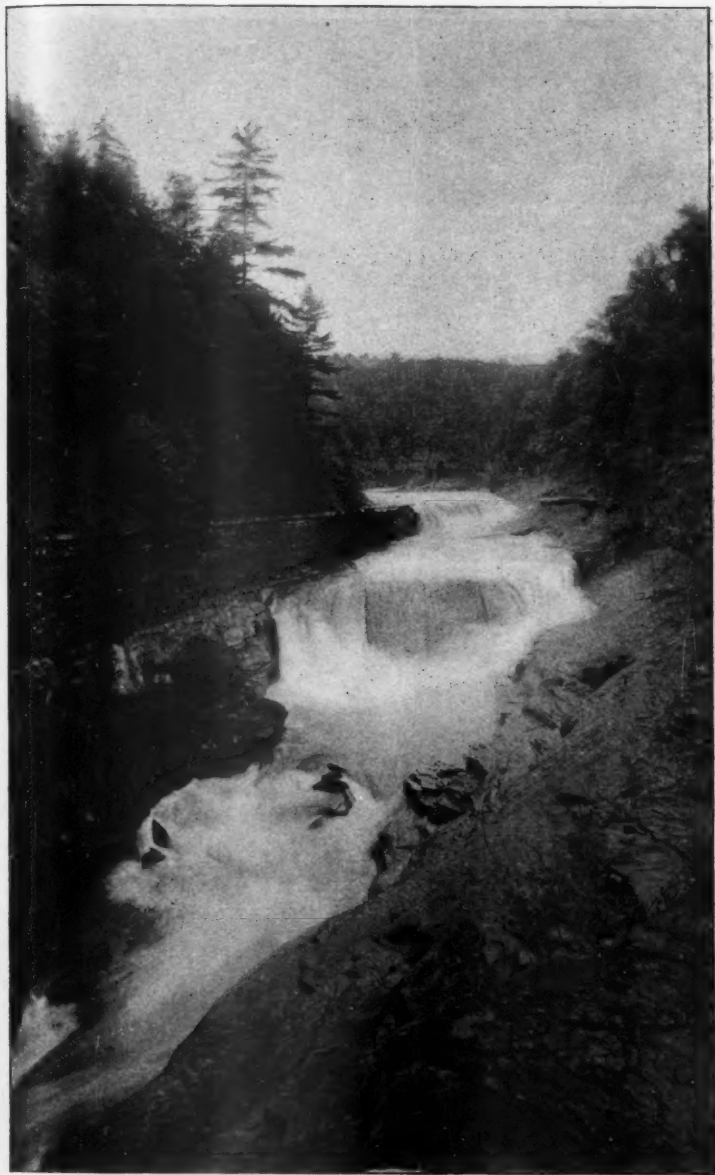
LETCHWORTH PARK: LOOKING UP STREAM TOWARD MIDDLE AND UPPER FALLS, FROM NEAR THE STANDPOINT OF THE ARTIST COLE.

In addition to the public highways which run through the park, Mr. Letchworth laid out private drives and romantic paths, erected rustic arbors and gateways, built stone walls by the roadside along precipitous places, constructed flights of stairs by which to reach some of the more salient points, and otherwise made the estate safe and accessible.

The many natural attractions to the park are supplemented by artificial objects of interest. This region was once the property of the Seneca Indians. The Indian Council House in which their last conference on the Genesee was held in 1872 has been removed from Caneadea to the park. It is built of hewn logs, the cracks chinked with moss and clay, and in the house are a mortar and pestle used by the Indians in pounding corn, a bark canoe, and other relics of the Red Man. Another interesting structure is the "White Woman's Cabin," in which Mary Jemison lived to an advanced age. When only thirteen years old, this Irish girl was captured by the Indians, adopted into the Senecas, became the wife of a chief, acquired much influence in the tribe, and refused to leave them when opportunities were afforded.

Mr. Letchworth for years has cordially invited the public to visit Glen Iris, and his regulations for the preservation of the place have always been cheerfully observed. The Portage bridge of the Erie Railroad, 800 feet long and 234 feet above the river, spans the river just above the "Upper Fall" and crosses the southern end of the park. The park extends just three miles along the Genesee as the stream runs. From its up-stream end and thence down stream for seventeen miles to Mount Morris the river flows through a narrow, deep, and picturesque gorge. At Portage bridge the land rises 308 feet above the bed of the river on the west side and 245 feet on the east side. A little north of the bridge the river makes a plunge of 71 feet at what is called the Upper Fall. About 2,100 feet below the Upper Fall and nearly opposite Mr. Letchworth's residence the river makes another plunge of 107 feet. This is called the Middle Fall, and its shape suggests the American Fall at Niagara on a reduced scale.

A few hundred feet below the Middle Fall the walls of the cañon are sheer precipices, 350 feet high—higher than the Palisades of the Hudson River opposite New York City. Nearly a mile and a half below the Middle Fall are the Lower Falls, an irregular set of cascades unevenly worn back and seventy feet high. The three Portage Falls, with their intermediate cascades, represent a total descent of about 290 feet. Thence the river continues through the chasm for



LETCHWORTH PARK: LOWER FALLS AND THE BEGINNING OF "THE FLUME."



LEITCHWORTH PARK: VIEW OF GORGES NEAR ENTRANCE TO RESIDENCE, SHOWING STRATIFICATION.

fourteen miles to Mount Morris, where it emerges into an alluvial valley from one to two miles wide.

Geologists have calculated that the Devonian rocks exposed in the Portage gorge were formed over 37,000,000 years ago. But the Glen Iris gorge is not a part of the ancient Genesee valley. It was cut through the thick mantle of glacial débris that accumulated in the Ice Age. Mr. Hall gives a popular account of what geologists have revealed of the life history of this wonderful gorge. Among the fossils is a superb mastodon head, now in the Letchworth Park Museum.

CLIMATE AND MAN.*

BY

ROBERT DE C. WARD, Harvard University.

Man's climatic environment affects him in many ways. His clothing, dwellings, food, occupations, and customs; his physical and mental characteristics; his systems of government; his migrations; his history—all are affected to a greater or less degree.

Civilized man protects himself more or less successfully against unfavourable climatic features. Thus, there is a gradual transition from the primitive shelter made of branches of trees, of skins, or leaves, to the permanent and highly elaborate modern building, which is both heated and cooled artificially. The building materials; the methods of uniting these materials, by braiding, or binding, or by the use of mortar, usually show the control of climate. Moreover, the material often determines the general plan of the building. There is also the transition from the primitive and scanty clothing made of leaves or bark where trees grow, or the skin of an animal where trees are lacking or warmer clothing is needed, to the manufactured and perhaps imported garment of wool, or cotton, or silk. Again, there is the increasing variety of food, from that of primitive man, supplied directly where he lives, to the highly-varied diet found in a civilized community to-day, to which distant latitudes are made to contribute their local delicacies.

All these changes man has brought about. But he cannot change his climate. Slight local modifications may be secured here and there, as by planting trees to serve as wind-breaks, or perhaps by in-

* From a forthcoming book on *Climate*.

creasing the relative humidity a little through the construction of an artificial reservoir. No such modification is possible in man's climatic environment as has been accomplished on the surface of the land under human agency. The atmosphere is as essentially un-alterable as it is all-pervading. When we see how plants and animals are affected by atmospheric conditions, it is not unreasonable that we should expect man to show effects of a similar kind.

It is, however, easy to go too far in calling upon climate to explain phenomena which we may otherwise find it difficult to account for. This was the mistake formerly made by many writers on this subject, as has been clearly pointed out by Ratzel in his *Anthropo-geographie*, where he gives an outline of many of these earlier views. Maupertuis and others held that the colour of man's skin becomes paler with increasing distance from the equator. Livingstone wrote that in Africa religious ideas also seemed to depend on distance from the equator. One writer held that cold produces a small stature; another believed that the Pygmies are small because of the heavy seasonal rains which fall in hot equatorial Africa. Climate was believed to explain the overhanging eyebrows and partly-closed eyes of the negro; the small eyes and beardless faces of the Chinese; the (supposed) fact that more twins were born in Egypt than elsewhere. And so on. The broad generalizations of Montesquieu, Voltaire, Buffon, Hume, Buckle, and others furnish interesting reading, and contain much that is suggestive and instructive, but they usually carry us well beyond the range of reasonable probability. Even Hippocrates' observations on climatic controls are not without value to-day.

To most of these older writers climate meant more than it does to-day. It included much of what is now termed our whole physical environment. Moreover, they based their conclusions upon incomplete records, covering far too short periods of time. It must be remembered that we are dealing here with large, important, highly complex phenomena. Man moves readily from place to place; from climate to climate. His food, drink, habits, occupations; to some extent his physical and mental characteristics, change in consequence. Inheritance, intermarriage, environment, opportunities, soil, and many other factors enter in to determine what changes individual man and the race as a whole shall undergo. Time is a very important element in the final result, for in time a gradual adaptation to new conditions takes place. Climate is but one of many controls, albeit a most important one, for it largely determines what many of the other factors, such as diet, customs, and occupations, for example,

shall be. The task of giving climate its proper place as a factor controlling the life of man as a whole is a difficult one, which cannot be definitely and satisfactorily solved to-day or to-morrow.

It would take us far beyond our limits were we to attempt any consideration of the many complex problems in connection with the possible influences of climate upon the physical and mental characteristics of man. Investigations along these lines have given rise to much debate. It is our present purpose merely to point out some of the more simple and obvious ways in which the life of man is controlled by climate. This control, it should be observed, is either direct, where physical and mental changes under climatic stimulus are concerned, or indirect, as when climate acts upon man through its influence over the distribution of the animals and plants, upon which man depends for his food, clothing, and materials of various kinds.

Climate determines both how and where man shall live. It classifies the earth's surface for us into the so-called habitable and uninhabitable regions. The deserts of sand and the deserts of snow and ice, whether the latter be near sea-level or high up on mountain tops, are alike climatic—the former because of aridity, the latter because of cold. The only non-climatic deserts are recent lava-flows. Where a soil is present which is not frozen for much over half the year, and where there is reasonable temperature and sufficient rainfall, plants and animals are found, ranging from few and lowly forms where conditions are the hardest and where all organic life is especially adapted to these conditions, to the greatest abundance, where conditions are most favourable.

Man is influenced by much the same controls as those which affect plants and the lower animals. From the highest latitudes he is excluded by cold. The higher altitudes are hostile both because of cold and of diminished pressure. The deserts of sand are uninhabited or thinly populated by reason of aridity. Forests, where rainfall is abundant, are unfavourable to a dense population. The trees must be cleared away before settlement is easy. Man is widely distributed over the earth's surface. In his migrations he has carried with him, beyond their original limits, many plants and animals. Ratzel points out that the coldest place in the world in January is a Siberian city, Verkhoiansk; while one of the hottest places in the world is Massaua, on the Red Sea, the capital of the Italian colony of Eritrea. But the life of man is harder here and easier there, according to climatic conditions and the scarcity or abundance of plant and animal life.

Man is distributed in great belts around the world corresponding roughly to the broad zones of vegetation, desert, steppe, and forest, the limits of which are set by temperature and rainfall, but man is much more dependent on rainfall than upon temperature. Water he must have, directly from the clouds, or indirectly through rivers, or springs, or wells, or from melted snow and ice. There are certain common conditions of life which affect the people who live in the same zone in the same broad, general way, just as these zones have similar general conditions of winds and of rainfall. This, as Ratzel has pointed out, means that there is a climatic factor at work to maintain differences between the people of different zones, in spite of the great movements which are constantly tending to produce uniformity. Obviously the differences in the life of man which depend upon climate will be most noticeable, and will be likely to have the greatest historical significance, when marked differences of climate are found close together, as in the case of mountain ranges like the Alps, or of a pronounced lowland, plateau, and mountain topography like that of Peru or Mexico.

All the regions of sparse population are gradually being encroached upon by an invasion from their borders. Forests are being cleared and replaced by open agricultural lands. Wheat and corn are replacing grass on the steppes and savannas, especially where irrigation can be practised. Deserts are being reclaimed for farming here and there where water is available. The more civilized man becomes, the denser the population which the different parts of the earth can be made to support. From the wandering hunting and fishing tribes of the African forest or of the borders of the Arctic Sea, through the farming populations of the cleared forest and of the steppe, to the crowded industrial centres of the modern city, there is such a gradation. It is the story of a more complete to a less complete mastery of man by his environment. But in spite of all that man can do, the largest climatic limitations persist. The Greenland desert of snow and ice and the Saharan desert of sand must remain practically deserted.

CROCKER LAND.

BY

EDWIN SWIFT BAILEY.

Dr. Fridtjof Nansen, in an article in *The Geographical Journal* (November, page 470), makes the statement:

"The northward extension of Greenland and its islands has been settled by Peary, new northern lands of the American Arctic Archipelago have been explored by Sverdrup, the northward and westward extension of the Franz Josef archipelago has been settled by the *Fram* expedition, by Jackson, and by the Duke of the Abruzzi; the small extension of Bennett island was discovered by Baron Toll. There is, in fact, no known land in the north whose northern coasts are not now explored."

Dr. Nansen's map, accompanying his paper, shows all the unknown region of the Arctic tinted off as if it were an ocean where soundings had been taken everywhere. He appears to think that there is no land in the area west of Grant Land, Axel Heiberg Land, and Prince Patrick Land; and he theorizes, apparently, to the effect that there is no unknown land remaining to be discovered, and that Mr. R. A. Harris' suggestion of a possible land in the unknown part of the Arctic is all wrong.

But American geographers, at least, know—even if others apparently do not as yet—that there is land in the region west of Axel Heiberg Land and Grant Land; namely, Crocker Land, discovered by the greatest of Arctic explorers and the greatest of sledgers, Robert E. Peary, who marks it on his map in *Nearest the Pole* as lying in about north latitude 82 deg. 30 min.=83 deg. 20 min., and west longitude 103 deg.=105 deg.

Commander Peary writes on June 24th that from an altitude of about 2,000 feet on the west coast of Grant Land (*Nearest the Pole*, page 202):

"Northwest it was with a thrill that my glasses revealed the faint white summits of a distant land which my Eskimos claimed to have seen as we came along from the last camp."

And further on June 28th (page 207):

"The clear day greatly favored my work in taking a round of angles, and with the glasses I could make out, apparently a little

more distinctly, the snow-clad summits of the distant land in the northwest, above the ice horizon.

"My heart leaped the intervening miles of ice as I looked longingly at this land, and in fancy I trod its shores and climbed its summits, even though I knew that that pleasure could only be for another in another season."

Of the northern, western and southern extensions of Crocker Land we know nothing, and, as far as any one can say at present, it may cover a considerable area. At any rate, its discovery is a direct proof in favour of Mr. Harris' theory, and against Dr. Nansen's theory. But the first traveller who explores Crocker Land will, perhaps, completely change all present notions on the unknown Arctic.

GEOGRAPHICAL RECORD.

AFRICA.

AGRICULTURAL DEVELOPMENT IN RHODESIA.—We have received from the Rhodesian Agricultural Union a report of the *Proceedings* of the Third Annual Farmers' Congress, held at Gwelo in June last year. It appears from Mr. G. M. Odum's paper on "The Status of Rhodesian Agriculture" that the pioneers, sixteen years ago, did not think of tilling the soil, but sought only for minerals. Many did not find the wealth they were seeking, and some tried to earn a living by farming. Their experiences did not encourage others to settle on the land. Cattle died mysteriously, crops failed, markets were limited, transportation was dear, and the cost of machinery was excessive. But gradually men learned how to conduct farming, railroads came in, and cattle increased rapidly.

The period of pure experimentation has ended, and the opinion is now general that no other enterprise in Rhodesia will yield so good a return as a properly-developed farm. There are now about 1,000 farmers, only about 1½ per cent. of whom have failed to establish themselves on a basis of complete self-support and the gradual accumulation of a small capital. About 48,000,000 acres are said to be available for agriculture or stock-raising.

Much of this region is nearer the Equator than the south end of Florida. The high elevation of the plateau above the sea, thus ameliorating the climatic conditions, is the chief geographical factor in fitting the land for occupancy by white farmers.

FORECASTING THE NILE FLOODS.—In his *Report* on the work of the Survey Department, Egypt, in 1906, Captain H. G. Lyons, Director General, says that, from February onwards, telegraphic reports of the rainfall were obtained from British Central Africa, German East Africa, British East Africa and Uganda, as well as from Mauritius, in order to trace the gradual advance of the monsoon rains. By means of these data and other meteorological information, collected in Egypt and the Sudan, and that which was supplied by the Meteorological De-

partment of India, it was possible to prepare monthly forecasts of the Nile floods which corresponded closely with its actual development. Information was also periodically telegraphed to India for use there in preparing forecasts. Captain Lyons proposes to advance another step in the investigation of the East African monsoon by obtaining kite records of the conditions of the upper strata over the southern Sudan during the rainy season.

RUBBER IN FRENCH WEST AFRICA.—The annual report of the British Consul at Dakar gives particulars of the steps which are being taken by the French Government in French West Africa to safeguard and develop the rubber resources of the country. A special survey is being made of the chief rubber-producing districts; and when the investigations have been completed the worst districts will be closed to rubber collection, so that the plants may have time to recuperate. It is expected that a beginning in this direction will be made in 1908. For the purpose of stocking plantations with rubber-producing trees, a credit of \$15,000 has been provided for the present year, with which sum it is expected that a large number of trees will be planted, in addition to nursery plantations for succeeding years. The intention is to set apart from \$24,000 to \$30,000 each year for this purpose.

CAPTAIN ARNAUD'S LONG AFRICAN JOURNEY.—Captain Arnaud of the French army has recently crossed, in 127 days, not only the Sahara but also the western extremity of Africa. *La Géographie* (No. 3, 1907) says that on March 18th last he and Lieutenant Cortier left Insalah, and on April 28th they reached Timiauin, in the territory of the Iforas-Tuareg, where they met, by previous arrangement, a military detachment under Captains Pasquier and Cauvin that had come from Gao on the Niger. After fourteen days at Timiauin, Captains Arnaud and Pasquier started south and reached Gao on May 22d. From this point Arnaud ascended the Niger and finally reached the coast of Dahomey on July 15. His entire route was 5,200 kilometers long, of which 1,200 kilometers were through unexplored territory.

FROBENIUS RETURNS TO AFRICA.—Mr. Leo Frobenius, the German ethnologist and explorer, whose researches along the Kasai River in 1904-6 are well known, has returned to inner Africa, to make further investigations. He is accompanied by Dr. Hugershoff as surveyor and geologist and Fritz Nansen as cartographer and photographer. The party will study, for a year, the little-known region to the south of the great Niger bend. Another year will be spent along the lower Niger, and, if the health and resources of the expedition permit, similar investigations may be extended to Togo and the Cameroons.

AMERICA.

IRON ORE RESERVES OF THE UNITED STATES.—About two years ago a Swedish geologist prepared a report on the iron reserves of the world in which he said that, at the present rate of consumption in the United States, this country was likely to run short of iron within the present century. This subject is discussed by Mr. Edwin C. Eckel, of the United States Geological Survey, in an advance chapter from "Mineral Resources of the United States, 1906." Mr. Eckel says, in brief, that the possibilities of error are enormous in estimates covering the total iron ore reserves in a vast area like that of the United States. The Lake Superior district, the leading American producer, will probably be called upon

to ship over 50,000,000 tons of ore a year before 1915, in which case the known Lake Superior ores can hardly be expected to last beyond the year 1950; but it is equally obvious that long before that date the value of good workable deposits of iron ore, both there and elsewhere in the United States, will have increased immensely.

Some large iron ore deposits are known in the Rocky Mountain and Pacific States, and others are reported; but it is impossible to estimate the total tonnage. It is probable that the magnetic iron ores in New York, New Jersey, and Pennsylvania will yield quantities far in excess of anything heretofore considered possible in those States. The Geological Survey, however, has studied the southern ores so extensively as to secure a fairly safe basis for tonnage estimate. The total estimated reserve for the red and brown ores of Alabama, Georgia, Tennessee, and Virginia is 2,500,000,000 tons, and the Survey assumes that the total southern ore reserve amounts to very nearly 10,000,000,000 tons, or five times that now credited to the Lake Superior region. In place of the 1,100,000,000 tons credited by the Swedish geologist, Mr. Eckel says it is probably safe to say that the United States have from eight to twenty times that reserve of iron ore.

PROF. GOELDI'S ALBUM OF AMAZON BIRDS.—The Society has received from the Museu Goeldi (Museu Paraense de Historia Natural e Ethnographica) the third and concluding instalment of Prof. Emilio A. Goeldi's "Album de Aves Amazonicas." The first instalment appeared in 1900. The completed Album forms a beautiful supplement to Dr. Goeldi's great work on the Birds of Brazil, published between 1894 and 1900. The album contains 48 plates (each 9½ by 12 inches), of which the concluding instalment contains 24 plates. The plates are superior lithographs, showing eight to ten birds on each sheet, grouped in their natural orders, with a background of vegetation illustrating their environment. The Museum and Professor Goeldi are to be congratulated upon the completion of this valuable work.

THE ABANDONED SHORE-LINES OF EASTERN WISCONSIN.—The late glacial and post-glacial history of the Great Lakes has been more thoroughly and accurately pursued in recent years than ever before. Some parts of the region have been studied with special care, and a contribution to this subject has just been made by James W. Goldthwait, assistant professor of geology at Northwestern University. His monograph, with the above title, is published as *Bulletin* No. 17 of the Wisconsin Geological and Natural History Survey. The writer gives a résumé of the development of the extinct lakes of the Great Lake region and of the changes in them while the ice-sheet was disappearing. Previous studies of the extinct lakes Algonquin, Nipissing, and Chicago are then reviewed, and attention is called to problems concerning their history, some of which are not yet solved. Most of the report describes the abandoned shore-lines of eastern Wisconsin, and gives in full the results of instrumental measurements of altitude. Especial features of the work are the large amount of data collected within a comparatively small district and the accuracy of the measurements—the Y level having been used rather than the aneroid or the hand level. The book has 134 pp., a good index, and is illustrated with many photographs and diagrams.

DIAMONDS IN PLACE IN THE UNITED STATES.—Diamonds have been found in about thirty localities in this country, but the only region where they have been

found in the place in which they originated has recently been discovered. Mr. George F. Kunz, the gem expert, and Dr. S. H. Washington, petrographer, have examined the find. The diamonds occur in an igneous rock, similar to that of South African mines, near Murfreesboro, Pike County, Arkansas. Two stones were picked up on Aug. 1, 1906, and at last reports the total number found was 130. Many are white and of good water, others are yellow, and some are of brown bort. The two largest stones weigh six and one-half carats, one being very fine white and the other brown. They are found on the surface as well as within the greenish, friable, decomposed peridotite, a rock resembling the famous blue ground of Kimberley. The property is being developed.

NEW MOUNTAINEERING JOURNAL.—The latest periodical in this line is *The Mountaineer*, a quarterly, issued in the interest of journeys afield, high ascents, and the study of mountains. It is published by the Seattle Mountaineers' Club at \$1 a year. The editor is Mr. E. L. Hampton. The first number, issued in March last, gave details of the organization of the Seattle Mountaineers' Club, general articles, including "The Mountains of Washington," by W. D. Lyman, and "Birds of the High Cascades," by William M. Dawson, and the plans of the Outing Committee for the first annual expedition of the Club. A large part of the June number is devoted to articles on the Olympic Mountains and the arrangements for the club expedition to the Olympics late in July. The magazine is excellently illustrated with photographs.

RAINFALL IN THE LAKE REGION.—A study of the average annual precipitation in the Lake region, by Professor Alfred J. Henry, of the United States Weather Bureau, appears in the *Meteorological Chart of the Great Lakes*, No. 1, 1907, and is illustrated by a chart. A previous computation of the annual precipitation in the Lake region was made by the same writer in 1899, and published in the *Meteorological Chart of the Great Lakes* for that year. Measurements of rain and snow have now been made for a period of thirty-six years (1871-1906) at 21 stations, which are considered as the standard stations, and the period 1871-1906 is taken as the fundamental period. The total number of stations used in determining the mean values and constructing the chart was 107, all but 7 of which had more than ten years' observations. The records of ten years and over were generally reduced to the fundamental period. The total amount of rain and melted snow is in general about 31 inches. The increase in precipitation due to the presence of the Great Lakes is probably not more than 2 or 3 inches annually. In 1894 Professor Harrington pointed out that areas of increased rainfall were generally southeast of the Lakes, and suggested as a probable cause the chilling of the air in its passage across the water. More recently Professor M. S. W. Jefferson has shown that the "islands" of heavier rainfall are areas of greater altitude, and that the increased elevation will account for the heavier rainfall. It is too early, as yet, to draw any conclusions as to possible secular variation of rainfall in the Lake Region. R. DE C. W.

A CAVE IN CALIFORNIA.—A large and remarkable cave was, according to the *Scientific American*, recently discovered in the Santa Susana Mountains, some fifty miles from Los Angeles, Cal. The cave contains many halls, some of very large extent, and the walls of one are covered with rude drawings, some of which are almost obliterated, but others are quite clear. The drawings represent incidents of the chase, showing Indians on foot pursuing bear, deer, and other animals. One wall drawing shows the bear pursuing the hunter. The work is executed in soft red stone.

CANADIAN FARM LANDS DESCRIBED.—The Report of the Surveyor-General of Dominion lands for the year ending June 30, 1906, gives 137 pages to concise descriptions of the townships that were surveyed during the fiscal year. Similar information is given in every annual *Report*, and it must be of considerable service to immigrants seeking new farms and to others interested in Western lands. The description of each township includes the means of communication by which it is reached, the quality of the soil, the crops for which it is most suitable, the nature of the surface, whether level, rolling, or swampy, the amount of timber, if any, the quality and quantity of water and also of wild grasses, and data concerning temperature, game, minerals, etc.

NEWFOUNDLAND FISHERIES.—In the report on the fishing industry of Newfoundland, prepared by the assistant collector of customs at St. John's (Board of Trade *Journal*, No. 558, pp. 267-9), the fisheries are divided into the Shore, Labrador, Strait and Gulf, and the Banks. The Shore fishery is carried on in the bays and along the coast only a few miles from the shore, the fish being captured by hook and line, cod nets, cod traps, and seines. The Labrador fishery employs about 20,000 Newfoundlanders, who visit that coast from June 1 to October 1, some carrying on the cod fishery at regular stations on the coast and the larger number following the fish wherever it is found. These fishermen, known as floaters, live on their fishing schooners (from 18 to 70 tons) and set their traps in or about harbours where they find the fish.

The Strait and Gulf fishery is carried on in the same manner as the Labrador fishery. Only 97 vessels, carrying 1,378 men, are engaged in Bank fishery, which was once the most prominent of the Newfoundland fisheries. On the Banks bultows are used. They are long lines of hooks which are baited and set on the grounds. The vessel being anchored, the bultows are set out by the fishermen, who use small, flat-bottomed boats called dories. The fish, when caught, are brought on board, split, washed, and salted, and stowed in the hold. When bait is exhausted or a full cargo secured, the vessel comes to the shore, discharges, and again sails.

JAMAICA NEGROES AND CLIMATE.—An instructive article on "The West Indian and American Negro: a Contrast," by W. P. Livingstone, in the *North American Review* for July 19, 1907, brings out clearly the importance of the climatic factor in the present status of the negro in Jamaica and in the United States. To quote:

It is necessary . . . to point out that the position of the white in America is more difficult in some respects than that of the white in the West Indies. That there is less hostility to the blacks in the latter sphere is not to be attributed altogether to the higher ethical principles dominating the actions of the British. Much is due to geographical conditions. The West Indian negroes are far distant from the main body of British whites, and neither comes into direct contact and competition with the other. Compared with the great masses of colored inhabitants, the white residents in the islands are a mere handful. The former do not claim equality, and they accept whatever social honor the whites voluntarily grant them. Fundamental race antipathy exists there as elsewhere, but it is not accompanied by friction, because the political and social contact is not sufficiently close and the climate prevents anything like economic competition. But, if the proportions of the population were equalized and the climate more adapted for white men, as in the United States, we should find a different state of things. Despite altruistic considerations, the whites would probably be much less tolerant of the negro and more averse to his social advancement.

R. DEC. W.

TIDE TABLES FOR THE PACIFIC COAST OF CANADA.—The latest issue of these Tide Tables, prepared by the Tidal and Current Survey in the Canadian Department of Marine and Fisheries, is for the year 1908. The tables include Fuca

Strait, the Strait of Georgia, and the Northern Coast. These tables are based upon observations of the tides, obtained from self-registering tide gauges, which are kept in continuous operation, day and night, throughout the year. This record is reduced by the latest methods of analysis by which the Tidal Constants are arrived at; and from these the tide tables are calculated.

ASIA.

SVEN HEDIN'S JOURNEY THROUGH TIBET.—The *Allahabad Pioneer* has published a long letter from Dr. Sven Hedin, dated Mansarowar Lake, July 25, in which he makes an outline report of his journey from Shigatse to Tok-chen on that lake. The journey has been richer in results than his previous one from the Aksai Chin south-east across Tibet to Shigatse, as he was almost the whole time in inhabited country. These results include 203 sheets of maps, 410 specimens of rock in connection with geological profiles, 700 panoramas, 26 astronomical points, the meteorological journal continued three times a day, detailed measurements of the volume of water at every river crossing, a collection of plants and a great number of sketches.

The contributions to physical geography and hydrography include the measurement of the large lake Amtchok-Tso, of which an isobathic map was made, the measurement of the height of many peaks and passes, and the correction of existing maps in a number of important particulars. He avoided, as far as he could, the routes through this region of Major Ryder and Captain Rawling, and says that whenever he came in contact with their map he was "filled with admiration for the excellent work they had done." Following the northern bank of the Tsan-po (Brahmaputra) and then the Ragha-Tsanpo, a northern tributary, he crossed the gigantic mountain range which is the water-parting between the Brahmaputra and the lakes without outlet in the heart of Tibet. He travelled to the southwest to the source of Ragha-Tsanpo and found that the map of this region is nothing like the reality. Dr. Hedin says that he received all over the country the greatest hospitality and kindness from both Tibetan officials and nomads. His explorations extended west of Shigatse over 400 miles.

DEVELOPMENT OF SUMATRA.—The Government of the Netherlands has begun the preliminary work for a railroad that is to extend nearly the entire length of Sumatra. Early in July several engineers were sent to the island to survey the route for a line between Medan at the foot of the mountains in the northeast part and Palembang in the south of Sumatra. The distance between the terminal points is about 630 miles in a straight line. A number of branches will connect the main line with ports along the coast. The sum of 50,000 gulden was appropriated for the preliminary survey. The *Ostasiatische Lloyd* (No. 32) says that the proposed railroad will be of the greatest importance in the development of Sumatra. Owing to lack of such facilities, by far the greater part of the island, rich in minerals and agricultural possibilities, has been almost useless.

METEOROLOGICAL STATIONS IN ANATOLIA AND MESOPOTAMIA.—Dr. Hugo Grothe, of Munich, has established a series of meteorological stations extending through western Anatolia and Mesopotamia. It is expected that they will supply information which is much desired concerning the meteorological conditions of the high plateau and mountain land of the Taurus system and of the plateau and steppes as well as the alluvial region of the Euphrates and Tigris. The stations are at

Marash, Urfa, Mesereh, near Kharkut; Kalat Shergat, and Babylon. A number of Government bureaux and scientific societies in Germany will bear the expense of maintaining these stations.

AUSTRALIA.

THE MURRAY BASIN IN AUSTRALIA.—The River Murray League of South Australia was organized on the idea that a complete system of locks and storage basins should be built to provide permanent navigation in the Murray River and its large tributaries, the Darling and Murrumbidgee Rivers, and insure an ample supply of water to meet all the requirements of irrigation. The League has published, under the title of "The Nile of Australia," a series of forceful articles, written by David J. Gordon, which appeared in various newspapers and did much to emphasize the importance of the policy which the League is promoting. Mr. Gordon tells in a very interesting manner of the discovery of the Murray River by Sturt and the service this river has rendered to the settlers. The author regards the question of river management as the greatest in Australia, and endeavours to show that for an outlay of about \$15,000,000 these rivers can be locked for a distance of 3,000 miles and permanent waterways assured.

EUROPE.

EROSION ON THE BRITISH COAST.—The Royal Commission on Coast Erosion has been taking testimony in London after visiting various parts of the coast. At one of the meetings, Sir F. Dixon-Hartland, M.P., said that between Middleton and Bognor the tide swept around from Selsey Bill and it was difficult to protect any part of that coast. He had spent \$10,000 on groins and had lost two acres of land. The parish church had been submerged and it had been necessary to build a new church. The Duke of Richmond's land, adjoining, was still being eroded. Even when groins had been laid at a depth of 14 feet the sea undermined them and they were swept away. It was cheaper to let the farming land go than to spend money trying to save it. The urban districts were generally able to take care of their coasts and the obligation of the Government to assist should be confined to rural districts and poor ports. Another witness expressed a fear lest the Isle of Wight should be cut in two by encroachments of the sea.

BRIGHT SUNSHINE IN THE BRITISH ISLES.—"The Distribution of Bright Sunshine over the British Isles" is discussed by Richard H. Curtis in *Symons's Meteorological Magazine* for September, 1907, and the article is accompanied by a chart showing the average annual duration of sunshine. The records used in the preparation of this chart are those of the burning recorder. A few records exceed twenty-five years, and series for shorter periods are available for a large number of stations. The shorter series have been weighted for the length of period they cover. The number of hours of bright sunshine is indicated by "isohels." The sunniest parts of the United Kingdom are the most southern, the annual total of hours' duration decreasing northward, from 1,900 hours in the Channel Islands to only 1,200 hours over the north of Scotland. The lines of equal duration show a strong tendency to follow the lines of the coast both in the east and the west, and this feature is well shown by the stations adjacent to St. George's Channel. A large part of the central area of England, and of the southwest of Scotland, is adversely influenced by the smoke and dust of the

large manufacturing centres. The map is, however, too small to show the details of this effect. May and June are the sunniest months, and December is almost everywhere the least sunny. In winter, the largest totals of sunshine are obtained in the rainy southwest, and at that time of the year the effect of the smoke from the towns is felt more severely than at any other season.

It may be worth noting, in connection with Curtis's new map of sunshine, that in 1891 the London Meteorological Office published Dr. R. H. Scott's "Ten Years' Sunshine in the British Isles." Dr. H. N. Dickson drew the first sunshine map for the British Isles from the data in this paper (*Scot. Geogr. Mag.*, IX., 1893). The *Atlas of Meteorology* (Pl. 18) reproduces Dr. Dickson's map.

R. DEC. W.

WEATHER AND CROPS IN ENGLAND.—*Nature*, Vol. 75, 1907, pp. 545-547, contains an abstract of a recent report by R. H. Hooker on the correlation between the weather and the crops in eight of the eastern counties of England. It appears that the autumn rainfall is more important for wheat than that for any other period. For barley the chief requirement seems to be a cool summer; and the same is true for oats, although the latter also need rain in spring. One general conclusion is reached—viz., the advantage of cool weather during late spring and summer for all crops except, possibly, potatoes. This seems to indicate that grain and roots give the best crops if developed gradually and uniformly. Neither heat nor rains are good for crops for some time before harvest. The condition of the seed sown is seen to be as important as the subsequent weather. The seed being dependent on the weather of the preceding year, there is a relation between the crops of one year and the weather of the preceding year. Curiously enough, the meteorological conditions for the best seeds are apparently somewhat opposed to those necessary for a bulky crop. Thus there is some explanation of the tendency to an alternation of good and bad cereal crops.

R. DEC. W.

WEATHER AND RAILROADS.—The *Quarterly Journal of the Royal Meteorological Society* for July, 1907, makes mention of two recent cases of a marked effect of special weather conditions upon railroad operation in England. On February 20, 1907, the London and Northwestern Railway had the greatest difficulty in maintaining its train service on the North Wales coast during a severe gale. The Irish boat train express from London to Holyhead, drawn by two locomotives, could not take water from the pick-up water troughs because the wind had blown the water out of them. In consequence, the train had to stop for water at a station. The 2.55 train from Chester, westward, was brought to an absolute standstill at Abergale. Between the strongest gusts of wind some progress could be made, but even then the speed was reduced to four miles an hour.

On March 26, 1907, a passenger train left the rails near Felling, on the North-Eastern Railway. Eight passengers were injured, and two of them subsequently died. The accident occurred at 1.45 P.M., on a hot, sunny day, and the Board of Trade report holds that there can be no doubt that the derailment was caused by a sharp kink being forced in the track, owing to the expansion of the rails, due to an unusually hot sun for the season of the year, probably aided by the position of the line in a deep cut. The nuts on the bolts of the fish-plates were all screwed up tight, as is the custom in the winter, and these were not slackened off; nor did the plate-layers go along this length of line in the middle of the day, as they do in the hot months of the year. The report

states that the derailment was purely accidental, being due to abnormal temperature and conditions for the time of year, which could not reasonably be expected by the men in charge of this particular section.

R. DEC. W.

GEOLOGICAL SURVEY OF IRELAND.—The Sixth Annual Report of the Department of Agriculture for Ireland for 1905-6 says that the Geological Survey was engaged during the year in completing the map and memoir of the country round Limerick showing superficial deposits, and was preparing a similar map of the Londonderry district.

THE PORT AND COMMERCE OF SAINT-NAZAIRE.—The Society has received from the Société de Géographie Commerciale, of that city, an attractive volume giving the history of the development of the port and an account of its present great industrial and commercial interests, together with striking pictures and a map in colours, showing the port as it is to-day. The volume was prepared in honour of the great improvements in the port recently completed, and it seems to mark the beginning of a new era of prosperity for Saint-Nazaire. Attention is drawn to the fact that fifty years ago the port was nothing more than a shelter for pilot boats, while to-day more than a million tons of merchandise are handled on its docks every year. No other port of France has sprung into so great importance in so short a time.

THE ALPS AS A WEATHER DIVIDE.—The Alps as a Weather Divide have attracted some attention on the Continent. We may accordingly put on record a recent experience when entering the St. Gothard tunnel on the south side in brilliant sunshine under a cloudless sky. We emerged in thirteen minutes on the north side in a fog so dense that it was difficult to believe we had left the tunnel. The fog diminished as we descended, but the evening was dull and gloomy all the way to Bâle.—(*Symons's Meteorological Magazine*, October, 1907.)

PENINSULA OF QUIBERON.—*Bulletin* 92 of l'Institut Océanographique is given to a paper by Prof. L. Joubin in which he expresses the opinion that this peninsula (coast of Brittany) will in time entirely disappear under the assaults of Atlantic storms. The peninsula is only nine miles long and less than two miles broad at its widest part, and about half way of its length its width has been reduced to a few rods over which the railroad passes. In this place waters from the Atlantic dash over the trains and fall into the bay on the other side. The waves are incessantly undermining the base of the sea front, and the upper rocks, thus undermined, are dropping into the sea. The east side shows a strong contrast; for it is a gentle slope, washed by the warm waters of the bay of Quiberon. All the settlements now stand on the eastern side, and there is a sharp contrast between the forms of life on the two sides. Only animals and plants that thrive in the salt water or the air of the sea are found in the western part of the peninsula, but there is not a trace of this marine life on the east side. The grasses of the mainland grow in the east, but only salt grasses thrive in the west. The waters of Quiberon bay under the lee of the peninsula are smooth and quiet, but it is impossible, even in the calmest weather, to skirt the Atlantic side in a boat.

THE GEOGRAPHICAL CONGRESS AT NUREMBERG.—An American who improved an opportunity to attend this Congress writes that there were hardly any foreigners among the 275 members present:

The meeting impressed me profoundly as an object lesson showing the true dignity of geography

when it receives its proper treatment as a science. The broad conception of its scope was evidenced by the great variety of topics presented and yet there was no danger of lack of unity in the point of view of the speakers, because they all had university training in geography as an independent science.

POLAR.

ARCTIC CRUISE OF THE DUKE OF ORLEANS.—The Duke of Orleans made a cruise last summer in the Kara Sea and along the coasts of Novaya Zemlia. Commandant Gerlache commanded his vessel, the *Belgica*, and had charge of the oceanographic studies. The other members of the scientific staff were Lieut. Bergendahl, cartography; Lieut. Rachlen, magnetic observations; Mr. Stappers, biology; and Dr. Récamiér. Heavy ice made the campaign very difficult, and the expedition was sometimes in peril. A letter from Dr. Récamiér published in *La Géographie* (No. 3, 1907) sums up the expedition.

On July 14 the vessel entered the Matochkin Shar and reached the Kara Sea without great difficulty. Although the sea was covered with ice, the *Belgica* was able to force her way south along the east coast of Novaya Zemlia. After three days a northeast wind drove the ice around the ship, and she was a prisoner. This wind persisted for five weeks, and the *Belgica* throughout was fast in the ice, was often under great pressure, and drifted first to the southeast and then to the southwest. She was finally forced out of the Kara Sea through Kara Strait, and the expedition found itself, wholly against its will, in Barents Sea.

Here the ice was as heavy as in the Kara Sea, and it was not until August 21 that the vessel reached free water off the coast of Gooseland in the southwestern part of Novaya Zemlia.

An attempt was then made to go north, with a view to doubling the north end of Novaya Zemlia. Unfortunately, the vessel ran on a rock in Gribovaya Bay and sixty tons of coal were thrown overboard, but finally, with the aid of the tide, she floated again. At last she reached the northern end of Novaya Zemlia, and then pushing westward towards Franz Josef Land, entered a belt of ice. It was decided, however, to retreat, as coal for only twenty days remained.

The scientific results were important. During the drift in the Kara Sea the net was constantly in use, and the collections will add to our knowledge of the marine fauna in this part of the Arctic. Commandant de Gerlache made a number of thermometrical soundings and took specimens of water at different depths.

The configuration of the submarine valley along the east coast of Novaya Zemlia, which Nordenskiöld discovered in the Kara Sea, was determined. The valley extends parallel to the coast and about twelve miles from it. The *Belgica* followed it between 72° and 70° N. Lat. Its depth varies between 150 and 300 meters, the depression being generally about 150 meters below the adjoining sea-floor. The water in this trough as Kara Strait was approached was found to be relatively warm. The geographical studies of the extreme northern part of Novaya Zemlia show that this region is very badly mapped.

CAPTAIN BERNIER'S CRUISE IN THE ARCTIC.—The Canadian steamer *Arctic*, formerly the German steamer *Gauss*, reached Quebec in October after a fifteen months' voyage in the Arctic Seas. The vessel, under the command of Capt. Bernier, left Quebec in July, 1906, and planted the British flag on Melville and Bryan islands, Martinland, and Bathurst, Somerset, Coburg, and North Lincoln

islands. Capt. Bernier has brought back records of the territories annexed and documents left by Sverdrup, Peary, and McClure were found and brought down. The Arctic wintered in Ponds Inlet.

DR. BRUCE'S EXPEDITION TO PRINCE CHARLES FORELAND.—The *Geographical Journal* (Nov., 1907) gives particulars of the work accomplished last summer in this region by the Scottish expedition under Dr. W. S. Bruce. In 1906, Dr. Bruce and the Prince of Monaco landed on the northeast shore of this island and surveyed a considerable part of it. In continuing the work this year, Dr. Bruce, in June, established a base camp on the southwest coast and spent several weeks surveying the neighbouring country. Weather conditions prevented an attempt to round the northern end of the island and return south along the east coast.

The two years' work in the Foreland has resulted in a detailed chart of the whole of the west coast on a scale of two inches to the mile; the mountainous interior has been similarly surveyed and a considerable portion of the east coast. Specimens of rocks and fossils, some of the latter, apparently, dating back before the Tertiary Age, promise to throw light on the geological history and formation of the island. Large collections of plants and birds were made, including some species not previously known to exist in the Spitzbergen group.

Dr. Bruce says that Prince Charles Foreland, with an average length of fifty-five miles and a breadth of six miles, may be divided into three regions: hilly country, extending for five or six miles from the southern extremity; next, low-lying land, nowhere more than sixty feet above sea-level, extending for fourteen miles; then the northern two-thirds of the island, comprising an almost continuous range of mountains, the highest peaks of which rise to nearly 4,000 feet. The mountains are much glaciated, some of the glaciers descending to the sea-level on the east coast. There is an extensive series of terraced beaches between the foot of the mountains and the sea.

THE AREA OF GREENLAND.—This has been calculated by Mr. H. Prytz, who gives the result in No. 33 of the *Meddelelser om Grønland*. His calculations give the area as 826,500 square miles, that of the ice-sheet at 712,750 square miles, while the settled districts of the west coast occupy 43,130 square miles.

THE DANISH SCIENTIFIC STATION IN GREENLAND.—Mr. M. P. Porsild, the director of this station on Disco Island, West Greenland, has made his first report, dated March 1 last. It is learned from the summary, which is printed in the *Geog. Zeitschrift* (1907, p. 335), that the station was erected in the fall of 1906 at Angakudsarrik in Østerdalen, to the east of Godhavn. The site is naturally well protected from the north winds, and though the snowfall was heavy and the winter was unusually severe, the work of the station was not interrupted. The library of 3,288 volumes was opened at Christmas, and the laboratory was ready for use by February. The work at the station proved to be a godsend to the poor people of Godhavn, for they were able to live on what they earned without receiving the usual relief.

THE PRINCE OF MONACO'S VISIT TO SPITZBERGEN LAST SUMMER.—The Prince of Monaco returned from Spitzbergen at the end of August, having completed the hydrographical work in Cross Bay, which he began last year. He again chartered a small steamer, the *Kvedfjord*, on which he had a Norwegian party under Captain Isaachen, who carried out the survey chiefly of the region between

Cross Bay and Magdalena Bay on the northwest coast of West Spitzbergen. The Prince also made a number of investigations of the higher atmosphere by means of kites and balloons. The ice and weather conditions were extremely unfavourable, and forced the expedition to leave Spitzbergen rather earlier than the Prince had intended. Among those who accompanied him, as his scientific staff, were Dr. Jules Richard, Capt. Bourée, Dr. Portier, and Prof. Hergesell.

VARIOUS.

Miss Helen Culver, of Chicago, has endowed the Geographic Society of Chicago with the Helen Culver Gold Medal, to be awarded for eminent service in the geographical sciences. The first award was made to the Norwegian scientist and explorer, Captain Roald Amundsen, upon the occasion of his address before the Society on Nov. 13.

The Thirty-first Annual Report of the Department of Geology and Natural Resources of Indiana is chiefly given to papers of economic importance relating to the petroleum, peat, and iron resources of the State. It is the twelfth of these *Reports*, prepared by W. S. Blatchley, the present State Geologist.

Professor Douglas W. Johnson has resigned his assistant professorship in the Massachusetts Institute of Technology, to accept an appointment as assistant professor of physiography in Harvard University.

Dr. Hiram Bingham has been appointed instructor in South American geography in Yale University.

The name of the British Central Africa Protectorate has been changed to Nyasaland Protectorate.

Among the articles in the annual report of the Smithsonian Institution for 1906 are: The Eruption of Vesuvius in April, 1906, by Prof. A. Lacroix; To the North Magnetic Pole and through the Northwest Passage, by Roald Amundsen; Iceland, its History and Inhabitants, by Jon Stefansson; Quaternary Human Remains in Central Europe, by Hugues Obermaier; The Origin of the Slavs, by Prof. Zaborowski; and National Reclamation of Arid Lands, by C. J. Blanchard.

Captain Johansen, the companion of Dr. Nansen on the journey from the *Fram* across the North Polar Basin, is spending the winter in the northwest of Spitzbergen.

The second part of the *Geographisches Jahrbuch*, Vol. XXIX, 1906, has recently been issued by Justus Perthes, Gotha. The literature of Meteorology for the period 1902-5 is recorded and briefly discussed by Dr. W. Gerbing. Owing to the increasing amount of material, it was possible to print only the titles of some works. Dr. Hermann Haack of Gotha has an exhaustive report on the progress of Cartography, and gives special attention to map-drawing and the cartographic expression of the forms of the earth's surface. The history of Geography is represented by the report of Prof. J. W. Nagl, of Vienna, on the progress of Geographical Nomenclature.

THE AMERICAN GEOGRAPHICAL SOCIETY.—A Regular Meeting was held at Mendelssohn Hall, No. 119 West Fortieth Street, Tuesday, November 26, 1907, at 8.30 o'clock, P. M.

President Huntington in the chair. The following persons, recommended by the Council, were elected to Fellowship:

H. King Sturdee.	Henry Edward Rood.
Joseph Parke Byrne.	V. Stefansson.
George E. Gartland.	Herdman F. Cleland.
Walter R. McDowall.	Thomas D. Leonard.
Charles Gibson Bennett.	

The President then introduced Mr. Ellsworth Huntington, who addressed the Society on a journey Across the Himalaya Mountains to the Unexplored Salt Desert of Lop.

Stereopticon views were shown.

On motion, the Society adjourned.

THE NINTH INTERNATIONAL GEOGRAPHICAL CONGRESS.—The Council of the American Geographical Society, at a meeting held November 21, appointed the following Delegates to the Congress to be held in Geneva, July 27-August 6, 1908:

Messrs. Archer M. Huntington, William Libbey, Fordham Morris, A. P. Brigham and E. L. Stevenson.

NEW MAPS.

AFRICA.

CAPE OF GOOD HOPE.—Geological Map of the Colony of the Cape of Good Hope. (Sheet 46.) Scale, 1:238,000, or 3.7 statute miles to an inch. The Geological Commission, Cape Town, 1907. (Price, 2s. 6d.)

The district whose geology is laid down on this sheet by A. L. du Toit lies west of the Orange River and Transvaal Colonies, from which it extends to 24° E. Long. Its predominant formations are the shales and boulder beds of the Dwika series, with intrusions of diabase surrounding a wide belt of dolomite of Karroo form; and succeeded in the west by the Kaap Plateau, with its dolomite, limestones, and shales of the Transvaal system. A geological section across the map is shown.

EGYPT.—Egypt. Scale, 1:50,000, or 0.7 statute mile to an inch. Sheets: I-I, II-II, II-III and IV-III N.E.; XIV-I S.W. Survey Department, Cairo, Egypt.

Hydrography, including the supply and drainage canals, is shown in blue and the roads in brown.

GOLD COAST.—Gold Coast. Scale, 1:125,000, or 1.9 statute mile to an inch. Sheets, 72-K-I (Coomassie), 72-K-III (Oboase), 72-L-IV (Komfrodoua), 72-R-I (Nsaba), 72-R-II (Accra), 72-W-I (Sekondi). Published under the direction of Major F. G. Guggisberg, R.E., Director of Surveys, London, 1907. Selling agents, W. & A. K. Johnston, Edinburgh and London, and Edward Stanford, London. (Price, 2s. a sheet.)^o

The publication of this important topographical survey is making rapid progress. Some details concerning the work were given in the *Bulletin* for Oct., 1907 (p. 627). The districts occupied by the numerous gold-mining concessions

are shown in red. While some areas are still white, a great variety and quantity of information are given, and the map will be very useful in the work of developing this colony.

RHODESIA.—Map of Rhodesia under the Administration of the British South Africa Company. Scale, 65 miles to an inch. British South Africa Company, London. (No date.)

The special feature of this map in colours is that the names and locations of the mines throughout the three Rhodesias are given. There are a large number of them in Southern, many in Northwestern, and comparatively few in North-eastern Rhodesia. The railroads open or projected and the telegraph lines are shown.

AMERICA.

U. S. GEOLOGICAL SURVEY MAPS.

UNITED STATES.—Map showing the Distribution of Granite and Related Rocks in Maine. Scale, 17 miles to an inch. U. S. Geological Survey, Washington, D. C., 1907.

Illustrates a monograph, "The Granites of Maine," by T. Nelson Dale, published as Bulletin 313. As the colours show, the areal distribution of granite is somewhat irregular. It is found chiefly in the western tier of counties, the eastern part of the State, and the Mount Katahdin region in the north-central part of Maine. The products of the Maine granite quarries in 1905 were worth about \$2,750,000.

U. S. HYDROGRAPHIC OFFICE CHARTS.

Pilot Chart of the North Atlantic Ocean, November, 1907.

Shows a considerable number of derelict vessels and drifting buoys. Pilot Charts of the North Pacific Ocean, November and December, 1907.

UNITED STATES.—Geological and Topographic Map of a Portion of Winn Parish, La. Scale, 1:62,500, or 0.9 statute mile to an inch. Geological Survey of Louisiana, Bulletin No. 5, Baton Rouge, 1907.

The area covered is in the hill land of northern Louisiana. The State Geological Survey made a topographic survey of this region so that its geological features might be correctly represented. The Survey is to be congratulated on its excellent work. The contour interval is twenty feet and upon the topographic data are imposed the geological features. For seven years past the Survey has been paving the way for the construction of detailed topographic maps of certain portions, if not all of Louisiana.

UNITED STATES.—A Facsimile of Henry Pelham's Map of Boston and Environs. Scale, 1,168 feet to an inch. W. A. Butterfield, Boston, 1907. (Price on linen with rollers, \$2.50; paper, \$1.)

Only seven copies of this important map are known to exist. It shows Boston and the environs as they were in 1777 with the military works as they were constructed in 1775 and 1776, the residences of leading citizens and the roads that figure prominently in the history of the Revolution in the days before the Colonial troops were driven out by the British. The map was a fine piece of work pro-

duced by an expert during the British occupancy and with the permission of the British commander-in-chief. Mr. Butterfield has reproduced it in an excellent manner.

UNITED STATES.—Soil Map of Prairie County, Ark. Scale, 1:63,360, or 1 statute mile to an inch. Bureau of Soils, U. S. Department of Agriculture, Washington, D. C., 1907.

The distribution of soils (8 types) is shown in colours. The soils are derived from unconsolidated materials that were laid down in quiet waters. The Arcadia silt loam is most extensive, covering about one-third of the area of the county.

UNITED STATES.—Map showing the General Distribution of Drumlins in Central-Western New York. (No scale.) By H. L. Fairchild. Bulletin No. 111, Geology 13, New York State Museum, Albany, 1907.

Illustrates a monograph by Professor Fairchild on this most remarkable group of drumlins. This area in New York has been under the observation of Professor Fairchild for several years, and his able paper, together with this map, in which the position of hundreds of drumlins is shown, is a very important contribution to the literature of this physiographic feature. The greater part of the drumlins extend between the northern limits of the Finger Lakes and Lake Ontario, and the data are imposed upon the Government topographic sheets on a much reduced scale.

CANADA.—Topographical Map showing the position of the Nakimu Caves in Cougar Creek Valley, Selkirk Mountains, British Columbia. Scale, 2,000 feet to an inch. From photographic and other surveys, July and August, 1905. Department of the Interior, Ottawa, 1907.

The map accompanies the report of the Surveyor-General of Dominion Lands for the year ending June 30, 1906. The report contains papers on the Nakimu Caves, which are situated a few miles from Glacier Station on the Canadian Pacific Railroad, and promise to be attractive to tourists. An inset on a scale of 160 feet to an inch shows the location and extent of the caves as far as they have been explored.

CANADA.—Telegraph Chart of the Gulf and Lower St. Lawrence and Maritime Provinces. Scale, 28 nautical miles to an inch. Revised to May 1, 1907. Department of Marine and Fisheries, Ottawa, 1907. (Price, 15c.)

Shows the telegraph and cable lines in operation or projected, the ordinary track of vessels, the distribution of lighthouses, and gives other information of value to shipping and commercial interests.

CANADA.—Nova Scotia and Quebec (Cape Breton Sheet). Scale, 1:250,000, or 3.95 statute miles to an inch. James White, Geographer, Department of the Interior, Ottawa, 1907.

A sheet of the "Standard Topographical Map" now in course of publication.

Besides Cape Breton Island, which forms four counties of Nova Scotia, parts of Antigonish and Guysborough counties, N.S., an inset, on the same scale, of the Magdalen Islands and contours of the adjacent sea-floor are given.

CANADA.—Railway Map of the Dominion of Canada. Scale, 1:633,600, or 100 statute miles to an inch. James White, Geographer, Department of the Interior, Ottawa, 1907.

Shows all the lines in operation, under construction and located, and gives

railroad statistics and tables of distances. The map will be especially useful in this time of rapid railroad development in Canada.

CANADA.—Map of Manitoba, Saskatchewan and Alberta. Scale, 1:792,000, or 12.5 statute miles to an inch. 3 Sheets. Department of the Interior, Ottawa, 1907.

Shows all drainage, settlements, railroads, the section lines of the Land Department Survey and contours of elevation in brown. It is worth noting that the Government and railroad surveys and other data now make it possible to show lines of equal elevation in the central plain of Canada with approximate accuracy.

CANADA.—(1) Electoral Divisions in Southern Saskatchewan; (2) Electoral Divisions in Southern Alberta. Scale, 1:792,000, or 12.5 statute miles to an inch. Department of the Interior, Ottawa, 1907.

These two sheets include the entire settled area of Saskatchewan and Alberta respectively. Green boundary lines show that, for purposes of representation in the Dominion Parliament, Saskatchewan is divided into nine and Alberta into seven electoral districts.

BRAZIL.—*Navigazione della R. N. "Dogali,"* comandata dal Cap. di Fregata G. Ronca sul Fiume Amazzone-Solimões-Marañon (Dic. 1904-Febbr. 1905). Scale, 1:1,500,000, or 23.67 statute miles to an inch. Three Sheets. *Bollettino* of the Italian Geographical Society. Rome, October, 1907.

One of the most detailed maps of the Amazon that has yet appeared. The river was mapped from its estuary to above Iquitos. A very large number of place-names are given.

CHILE.—Comisión Chilena de Límites. Sheets: Llanquihue (2 Sheets), Magallanes (2 sheets). Atacama. Scale, 1:250,000, or 3.95 statute miles to an inch. Oficina de Límites, Santiago, 1907.

These sheets continue the topographical delineation of the regions on both sides of the Chile-Argentina boundary that has appeared in the earlier issues. Each topographical sheet is accompanied by another, showing the traverse and triangulation lines upon which the former is based. In addition to the work of the Chilean Boundary Commission, the charts of the Chilean Hydrographic Office, the surveys of the Argentine Boundary Commission, and other cartographic data are utilized. This notable work is now approaching completion.

ECUADOR.—Mapa Geográfico-Histórico de la República del Ecuador. Por el R. P. Fray Enrique Vacas Galindo. Scale, 1:1,500,000, or 23.67 statute miles to an inch. (4 Sheets.) Quito, 1906. Published by Henry Barrère, 21 Rue du Bac, Paris. (Price, 20 Fs.)

A notable map, to which Father Galindo, long a resident of Ecuador, devoted years of labour. His own extended travels enabled him to place on the map a considerable number of rivers hitherto unknown; and in the compilation he used all serviceable map material, including Dr. Wolf's map, which was especially helpful in the Andean region. The historical feature relates to the boundaries as fixed by treaty or claimed by adjacent countries, and all of them are depicted in colours. The mountains are shown in brown and the hydrography in blue, the distribution of the numerous Indian tribes and the head of navigation on the rivers are marked, and the relative importance of places is indicated by the different sizes of type. The mechanical production of the map in Paris was excellent. Railroads are shown as in operation, building, or projected. The Government,

which defrayed the expense of producing the work, has given it official standing, and requires that it be used in the universities and colleges of the republic. This product of great labour is fully worthy of such an endorsement.

ASIA.

CHINA.—Map of the Expedition of the Grum-Grjimalo Brothers into Western China (1889-1890). Scale, 20 versts to an inch. Sheet 1, Tian-shan; sheet 2, Bei-shan; sheet 3, Nan-shan. Drawn from route surveys by M. E. Grum-Grjimalo. (In Russian.) Imperial Russian Geographical Society, St. Petersburg, 1907.

These map sheets illustrate the superb folio constituting Vol. 3 of the work entitled "Account of a Journey into Western China," describing the journey of the Grum-Grjimalo brothers. The routes are in red, hydrography in blue, and the mountains in brown and white with effect of relief.

EUROPE.

ALBANIA.—Utazasok Ejszak Albaniaban. By Franz Baron Nopcsa. Scale, 1:100,000, or 1.5 statute mile to an inch. *Bull. of the Hungarian Geog. Soc.* Vol. 35, No. 5. Budapest, 1907.

This map records the work done by Dr. Nopcsa, the Hungarian geologist, during his travels in northern Albania in 1905-6. It illustrates his paper printed in the above-named periodicals. The large scale permits the introduction of much detail; and an inset shows the geological formations of the region.

ICELAND.—Islands Östkyst. (Langanes-Vestrahorn.) Scale, 1:250,000, or 3.95 statute miles to an inch. (2 Sheets.) Danish Admiralty, Copenhagen, 1907.

These sheets are a chart of the coast of Iceland from the extreme northeastern peninsula, south to $64^{\circ} 15'$ N. Lat., taking in the entire east coast. Contours of the sea-floor are given for two degrees of longitude eastward, together with many lines of soundings in meters. Symbols show the nature of the bottom, and the topography of the coast region is defined to the heads of the fiords or beyond.

ICELAND.—Islands Vestkyst. Scale, 1:40,000, or 0.6 statute mile to an inch. With insets of Reykjavik Harbour and Hafnar Fiord on a scale of 1:20,000, or 0.3 statute mile to an inch. Danish Admiralty, Copenhagen, 1907.

Depths and heights are in meters. The large scale permits a detailed delineation of the contours of the coasts and of the sea-floor in the fiords.

POLAR.

ARCTIC.—Chart showing Capt. Roald Amundsen's Route, April 24-Sept. 3, 1901. With Surface Temperatures and Salinities. Scale, 1:4,000,000, or 63.1 statute miles to an inch. The Fridtjof Nansen Fund, Christiania, 1906.

The map illustrates the monograph "Northern Waters: Captain Roald Amundsen's Oceanographic Observations in the Arctic Seas in 1901. With a Discussion of the Origin of the Bottom Waters of the Northern Seas by Dr. Nansen."

After Amundsen had purchased the *Gjøa* he made a preparatory cruise in order to try the vessel and to gain experience with her in the ice. As he desired to use the opportunity for scientific work, Nansen proposed that he should make oceanographic observations with modern instruments, and these were procured.

Amundsen's numerous surface observations on this cruise, recorded on this

chart, give most valuable information about the distribution of temperature, salinity and density on the surface of Barents Sea and the Northern Norwegian Sea in the summer months of 1901. At the same time the captains of the three sealing vessels—the *Capella*, the *Jassai*, and the *Hvidfsken*—were also taking surface observations (temperature and water samples) for the Bureau of the Norwegian Fishery and Marine Investigations. These results are also placed on the chart.

The whole of the material thus recorded gives an unusually full account of the distribution of surface temperatures and salinities in the months of May, June, and July, 1901. Isohalines in blue, in the opinion of Dr. Nansen, give a fairly correct idea of the horizontal distribution of the salinity at the surface for the end of June and the beginning of July. No isotherms were drawn, as the surface temperatures vary rapidly with the season.

ARCTIC.—Bathymetrical Chart of North Polar Seas. Scale, 1:20,000,000, or 315.6 statute miles to an inch. By Dr. Fridtjof Nansen. *Geog. Jour.*, Nov., 1907, London.

Illustrates Dr. Nansen's paper on north polar problems, a part of which is published in the November number of the *Geographical Journal*. Ocean depths are shown in meters and fathoms. Tints of yellow show the continental shelf, and of blue the oceanic depths as far as they are yet known in the Arctic.

MISCELLANEOUS.

BRITISH EMPIRE.—The British Empire in its True Proportions. Designed and published by Stephen Smith, Edinburgh (no date).

The map is constructed on different planes in such a way as to show the relative sizes and positions of the British Isles, their colonies, and dependencies. The sea routes between the United Kingdom and the colonies shown on the map aggregate over 100,000 miles in length.

HACHETTE'S ANNUAL SUPPLEMENT.—L'Année Cartographique. Supplément Annuel à toutes les Publications de Géographie et de Cartographie. Par F. Schrader. Dix-Septième Année. Hachette & Co., Paris, 1907.

Presents the important geographical and political modifications of the maps in 1906 on three double sheets, in colours, with explanatory text on the reverse. The Asia sheet shows the route of Major Bruce between Leh and Peking, the results of the Franco-Siamese Treaty of March, 1907, the new Siam-Cambodia frontier, the routes of A. F. Stahl in Persia, and the itineraries of French explorers in western China. Africa: The Central Sahara according to the latest investigations, Mauritania and the valley of the Ferlo after the surveys of Captains Gérard and Vallier, the north and northeastern frontiers of Nigeria according to the latest boundary agreements, the region between Kanem and Borku after Captain Mangin's explorations, the Congo and the Bahr el Ghazal after the surveys of Lemaire and the itineraries of Roulet, and the Turkish Egyptian frontier according to the agreement of October, 1906. America: Lange's survey of the Rio Pilcomayo, the route of Amundsen's Northwest Passage, Peary's Farthest North, eastern Labrador after the surveys of Mrs. Leonidas Hubbard and her map produced by the American Geographical Society, the new States of Colombia, and the hydrography of the eastern slope of the Peruvian Andes.

BOOK NOTICES.

The Pocket Guide to the West Indies. By Algernon E. Aspinall.

xii and 316 pp. Illustrations, Maps, Tables and Index. Edward Stanford London, 1907. (Price, 6s.)

The West Indies are becoming more and more a profitable hunting ground for health and enjoyment, now that the facilities for reaching and travelling through them have been improved. This thorough little volume deals chiefly with the Lesser Antilles, especially with the British Islands, and also with British Guiana. No attempt is made to treat Cuba or Porto Rico, for they would require more space than could be given to them in this book; and the island of Haiti is also summarily dealt with because its bad sanitation and inferior accommodations for visitors make it an unsuitable place for the average visitor. The book, however, covers admirably, for tourist purposes, all the important islands of the Lesser Antilles, contains much local information, gives statistical facts at the end of the volume, and is illustrated with a considerable number of photographs and maps.

Les Musulmans Français du Nord de l'Afrique. Par Ismaël Hamet.

Avec un Avant-Propos par A. Le Chatelier. iv and 316 pp., 2 Maps. Librairie Armand Colin, Paris, 1906. (Price, 3.50 fr.)

The book treats thoroughly and in an interesting manner the complex question of the native races living under the French régime in North Africa, the new influences which the French introduced among them, and their effect upon the inhabitants. The author treats of the composition and distribution of the Mohammedan population, gives a summary of our knowledge of the early Berbers and Arabs, discusses the civilization born of Islam, describes the fusion of the Arabs and Berbers, depicts the native society at the time of the French conquest, and later deals with the influence of colonization and the agricultural, commercial, and intellectual evolutions that have come to pass, and gives his views on the future of the native population.

Many facts are given to show that at the time of the French conquest of Algeria scarcely a group of native inhabitants could be found that was ethnically pure; that nearly all the people were a mixture resulting from the absorption into the Berber mass of all the Arab elements derived from the Orient or from Spain with some infiltration of negro blood; and that this population was divided, according to circumstances, into burghers or residents of the towns and peasants or dwellers in the country, the latter being divided into nomadic groups and those of fixed habitation.

Irrigation in the United States. By Frederick Haynes Newell.

(Revised edition.) xix and 435 pp., 68 Plates, 94 Figures, and Index. Thomas Y. Crowell & Co., New York, 1906.

Irrigation is one of the great public questions in our country. For the past seventeen years, Mr. Newell has been continuously conducting investigations as to the extent to which our arid regions may be reclaimed. As chief engineer of the

Reclamation Service, he is still superintending the field studies relating to the flow of rivers useful for power, irrigation, and other industrial purposes, ascertaining the cost and capacity of reservoirs, and mapping the underground waters.

No man is better fitted than Mr. Newell to describe the means by which it is hoped to turn our waste and desolate public lands into rich fields and thriving homesteads. He gives in this volume a popular description of irrigation and of the devices for obtaining and distributing water. The results of his own study and experience and those of many other workers in the same field are here described for the benefit of the general public. The book fills a public need.

Coillard of the Zambesi. The Lives of François and Christina Coillard, of the Paris Missionary Society, in South and Central Africa (1858-1904). By C. W. Mackintosh. xix and 484 pp., Frontispiece, a Map, 77 Illustrations, 3 Appendices, and Index. The American Tract Society, New York, 1907. (Price, \$2.50.)

François Coillard was not widely known until Serpa Pinto, the Portuguese explorer, told how the gentle missionary had saved his life. Later explorers wrote much of Coillard and his devoted wife, telling again and again the wonderful story of the pioneer mission they founded on the upper Zambezi, of the great influence they finally came to exert over the Barotsi, and especially over King Lewanika, who developed a great liking for the comforts and blessings of civilization, with the result that great changes have been brought about in his country.

Coillard played a great part in this transformation, and perhaps no missionary name, excepting that of Livingstone, will be greater in the history of African progress than Coillard's. This book tells the story of his great but unpretentious work, describes the peoples in the regions where he laboured, and shows that the material results of his efforts to improve the conditions of life in Barotsiland were very fruitful, though Coillard did not live to see all the good that his influence and persistent labour helped to bring about. This volume, which is handsomely illustrated, will have a worthy place among the records of African development.

Spirit Lake. By Arthur Heming. x and 335 pp., 23 Illustrations. The Macmillan Company, New York, 1907. (Price, \$1.50.)

Mr. Heming is reputed to have intimate acquaintance with the manner of life, customs, and religious ceremonies of some of the Indian tribes of Canada. In this volume he has endeavoured to give a popular account of phases of primitive life by using his anthropological material in the form of stories with a considerable admixture of Indian folklore and legend.

Rubber Cultivation in the British Empire. By Herbert Wright. vii and 100 pp., Illustrations, and Tables. MacLaren & Sons, London, 1907.

Mr. Wright first discusses the importance of rubber cultivation and the development of a market for rubber. The succeeding chapters treat of the sources of rubber geographically and botanically, wild and plantation rubber, the history of its introduction in various parts of the British Empire, methods of planting, curing, manufacture, etc.

The author says that there are now about 250,000 acres planted to rubber in the Orient, and that during the next few years the annual increase in planted

area is likely to be on a very large scale, especially in Ceylon, Malaya, Borneo, Java, and Sumatra. Ceylon doubled its rubber production in 1906 over 1905. Very many of the wild rubber areas in Africa and America are gradually being transformed into plantations.

On the Trail of the Immigrant. By Edward A. Steiner. Third Edition. 375 pp., 15 Illustrations, and Index. Fleming H. Revell Company, New York, 1906. (Price \$1.50.)

One of the most notable books on the immigrants into this country. The author, a foreigner by birth and a professor in Iowa College, has made a special study of the immigration system and the various groups of immigrants. His book contains much on these matters that is not commonly known, though of interest to our people. Steiner has often travelled with immigrants in the steerage, has studied them in their old-world homes, investigated the influences which drew them Westward, and has lived with them also in their early days among the new and strange aspects of America.

A few statements about the Jewish immigrants may be given here in very condensed form. The author says our Jewish population may be divided into four large groups: (1) The Spanish-Portuguese Jews, who are the real aristocracy, rarely poor and centred almost entirely in the Eastern cities, where they are found in the upper world of finance and in business and professional life. This group is now receiving scarcely any additions through immigration; (2) German Jews, who have most faithfully adjusted themselves to American life. Out of this group have come most of the prominent Jews in the United States. They have developed what may be called an American Judaism in which liberal tendencies prevail; (3) Austrian and Hungarian Jews, many of whom remain orthodox. They are more clannish than German Jews, grouping themselves into centres according to the districts from which they came. This is especially true of the Hungarian Jews. The coffee houses of "little Hungary" in New York draw their revenue largely from these Jews. Among them are shrewd traders, pawnbrokers, and a very small proportion of peddlers. They are largely engaged in mechanical labour, being wood and metal workers, and makers of artificial flowers and passementerie; (4) the Russian Jews, the youngest army of the immigrants, ultra-orthodox, yet ultra-radical, traders by instinct, and yet among the hardest manual labourers of our great cities.

The author describes many unnecessary hardships and much injustice which too often attend the transportation of these European immigrants.

A History of Oneonta. From its Earliest Settlement to the Present Time. By Dudley M. Campbell. 190 pp., and Illustrations. G. W. Fairchild & Co., Oneonta, 1906. (Price, \$1.00.)

The author has put into this book much information from private and public sources relating to the earliest days of the town and its later history. Oneonta, now a flourishing little city of New York, was settled late in the eighteenth century, and became a trading centre because such a convenience was needed by the surrounding farmers. Indians were numerous there in those days. The book contains many pioneering as well as later experiences, and its story illustrates very well the origin and growth of many of our towns.

Biskra. Von Ludwig Finckh. 82 pp. and 8 photographs. Deutsche Verlags-Anstalt, Stuttgart und Leipzig, 1906.

A tasteful little book both in its contents and its mechanical production. There are four short chapters on Corsica and thirteen on the many phases of Biskra, the famous oasis, health resort, and centre of date palms, where many tourists now get a glimpse of the Sahara, a whiff of its atmosphere and a little experience of its life. The guides of Biskra, the Arab market, the holy Marabout, the Negro settlement, traders, wine, women, and children and the spreading waste are among the topics. We have here a vivid series of impressions rather than a tangible setting forth of facts. It is good reading, and doubtless imparts accurate conceptions of Biskra without being, in any sense, a guide-book.

Ethnographic Notes in Southern India. By Edgar Thurston, Superintendent, Madras Government Museum. With 40 plates. Madras: Government Press, 1906.

This is a collection of eighteen essays relating to specific ethnological subjects, just those that are peculiarly characteristic of South-Indian cultures, like deformity and mutilation, torture in bygone days, and a few stray survivals, slavery, fire-making by friction, fire-walking, hook-swinging, infanticide, couvade, earth-eating, and boomerangs. Besides, marriage customs and death ceremonies are dealt with in fullest detail. Every ethnologist and culture-historian is indebted to this industrious author for his painstaking research and eager collecting of material and information which have heretofore been scattered and buried in official reports, manuals, gazetteers, journals, and other publications. It is well worthy a place in the library of every practical worker in this field. B. L.

The Story of Oxford. By Cecil Headlam, xv+435, 47 Illustrations, and Index. J. M. Dent & Co., London, 1907. (\$1.50.)

With this book in hand a visitor to Oxford will enjoy a double charm. The rich individuality of this "sweet city of the dreaming spires" lends itself readily to the pen of a clear-sighted and accurate chronicler. Oxford is fortunate in having as historian and guide one who has imagination as well as insight, and a pleasant style as well as command of facts. He breathes life and interest into the driest events of history, and the dull details of street and edifice. It is most interesting to note how a place whose life early centres around a University reflects in its growth all the characteristic phases of national social development.

Like many another town, its social life begins with the miracles and church building of its patron saint. At the start a religious flood nearly engulfs it. But the sturdy independence and common sense of the townsmen rebel, and the religious wave recedes. From this time Oxford begins its history as a University town. But its pulse beats with that of the country, and it takes its part in the religious and political conflicts of the nation. Names of great men are on its roll. More, Colet, Wycliffe, and Tyndale begin their work under the inspiration of the University. Kings and queens cajole and court it. The University town becomes the Court and the beleaguered capital of the rejected Charles I. and the asylum of the exiled James. After the follies and vices of camp and Court are shaken off, it stands again as a bulwark against the frivolities of the new, and yet as a conservator of what is best in modern progress.

The book is enriched by numerous tasteful illustrations and well-arranged appendices, the latter giving in outline all necessary information in regard to the various colleges.

H. P. L.

Die Bodenschätze Schlesiens. Erze, Kohlen, Nutzbare Gesteine. Von Dr. Arthur Sachs. viii and 194 pp., and Index of Places. Veit & Company, Leipzig, 1906. (Price, M. 5.60.)

This volume contains a practical account of the economic mineral resources in one of the great mining regions of Prussia. It gives the geology, productivity, and other facts relating to the mining and quarrying fields of Silesia, and thus deals with the foundations of the most highly-developed industries of the province. References are given to the literature required by those who need to go more deeply into the mineralogy and some other scientific aspects of the subject.

Recherches Anthropologiques en Égypte. Par Ernest Chantre. xviii and 318 pp., 159 Figures, many from photographs. A. Rey & Co., Lyons, 1904. (Price, 50 fr.)

This is a handsome folio, fully worthy, in typographical appearance, paper, and illustrations, of its rich contents. Dr. Chantre, who is at the head of the Department of Anthropology in the University of Lyons, presents in this sumptuous volume a review of the population of ancient and modern Egypt and its neighbouring territory in relation to their history, physical characteristics, and handiwork. The first half of the book is devoted to the people of ancient Egypt. In this the author presents in readable form and with essential detail the results of many explorations, chiefly German, British, and French, in this great field. He traces the results of anthropological research from the first to the thirtieth dynasty down through the Grecian, Roman, and Byzantine periods. The second half of the book is given to the Egyptians of the Middle Ages and modern times. The numerous references to the literature of the subject are printed as footnotes.

The work is not only scientific but also, owing to the clear and excellent style in which it is written, it is adapted for the perusal of all intelligent readers who are interested in anthropological study. The author says that the numerous physical measurements made of Egyptians throughout historic times prove that the race has been practically homogeneous in every age. No enduring external influence has affected the type of the local population. The Nile valley seems to assimilate all foreign types to itself. The very close similarities between the Egyptians and the Bedjas and Berbers of Tripoli and Algeria prove their common origin; and Egyptian culture, as well as its population, is essentially indigenous.

Guide to Tsingtau and its Surroundings. By F. Behme and M. Krieger. Second Edition. 159 pp., 82 Photographic Illustrations, 8 Maps and a Plan of the Town. H. Wessel, Wolfenbüttel, 1905.

Tsingtau is the capital of Kiauchou, the German Protectorate in China, and is the port and the only European settlement in that district. The city has the rare advantage both of the seaside and of the mountains, and the town and its environs have novel attractions for the foreign tourist. It has excellent hotels of European model and a fine bathing strand lined with many bath-houses. This guide-book tells how to get to Tsingtau, describes the place and presents a large plan of it, and gives over fifty routes, long or short, with mention of what is to

be seen on the way or at the end of them. A trip by rail from Tsingtau to Tsinan fu, 395 kilometers, is outlined, and there is this laconic paragraph on a matter of interest:

T'shue fu, on passports and cards being presented to Duke Kung, permission is granted to visit the temple and tomb of Confucius.

The maps and illustrations are excellent.

L'Allemagne Contemporaine Illustrée. By P. Jousset. 282 pp., 588 Photographic Reproductions and 22 Maps, of which eight are in colors. Librairie Larousse, Paris, 1907 (?). (Price, 18 fr.)

A popular work (folio) on Germany, with accurate descriptions of the country in its various geographical aspects. The coasts and ports are first treated, and then Berlin and its environs. The remainder of Germany is treated by its larger river basins, these chapters being preceded by a general view of the country's relief, hydrography, and other physical features. The letterpress is well written and accurate, but the crowning feature is the superb photographic illustrations which supplement the text as nothing else could do and show how valuable a feature photography is in geographical instruction. The maps are excellent and the table of contents makes it easy to find all information in the book.

Die Geest Ostfrieslands. Geologische und Geographische Studien zur Ostfriesischen Landeskunde und zur Entwicklungs-geschichte des Emstromsystems. Von Dr. Rudolf Bielefeld. 173 pp., 3 Maps, 4 Tables, and 2 Profiles. J. Engelhorn, Stuttgart, 1906. (Price, M. 10.)

This is number 4 of Vol. 16 of "Forschungen zur deutschen Landes- und Volkskunde." It is a first-rate geological and geographical study of East Friesland and of the development of the Ems River system, in which the author traces the glacial influence in this region, various modifications of the surface, and the physiography of the Geest area which has been profoundly influenced by climatic conditions.

Terrestrial Magnetism and its Causes.—A Contribution Towards the Elucidation of the Problem. By F. A. Black. xii and 226 pp., 23 Illustrations and Diagrams, 6 Appendices, and Index. Gall and Inglis, London, 1905. (Price, 6s.)

The author, as he says in his preface, is not a professional physicist. It may be said, however, that as an amateur dealing with a scientific subject of unusual complexity, he has written a worthy book that commands the respect of scientists. Leading workers in the field of terrestrial magnetism have already accorded to Mr. Black's volume the merit that it is clear and scientific in treatment and accurate in the ideas developed.

The author has nothing to say that is new to the specialist in this branch of physics, and parts of the book are quite elementary, but all the better adapted on that account for the enlightenment of a wide circle of readers. Mr. Black explains the phenomena of the magnetic earth and magnetic variation by the movement of the earth in the electrical field of the sun. He wrote before Amundsen had practically demonstrated that the north magnetic pole is not a point, but may be a large area, and Mr. Black says this concerning the problem:

We have got into the way of thinking of the magnetic pole as a definite point on the earth's sur-

face, a spot which we can stand upon. Ross has given us the actual geographical position of the American pole not only to degrees but to minutes While in a certain sense this is no doubt correct, in another sense it seems to be misleading. Even in an ordinary bar magnet the poles are of appreciable size and in comparison with the magnet they are of considerable size. If then, the earth is a magnet, what must be the size of its poles? It can scarcely be questioned that they must cover a large area.

The book may be heartily commended to that part of the public which would like to know the present state of our knowledge of terrestrial magnetism.

Side-Lights on Astronomy and Kindred Fields of Popular Science.

Essays and Addresses. By Simon Newcomb. viii and 350 pp.,

Illustrations and Index. Harper & Brothers, New York, 1906.

This is in the main a collection of essays and addresses which have appeared in various magazines from 1882 to the present. For the purpose of this republication, Dr. Newcomb revised the material and brought it down to date. The chapters illustrate admirably his ability to treat in a popular way, for all intelligent readers, many of the great facts of science.

Although his topics are chiefly astronomical, he has also included discussions relating to general scientific subjects, such as the mariner's compass, geometry, the organization of scientific research, the outlook for the flying machine, and several others. In the field to which he is especially devoted, he treats the unsolved problems of astronomy, the structure and extent of the universe, the life it may support, and new problems relating to the Cosmos which the advance of science has brought to the front. He writes of the universe as an organism or a connected whole, tells how planets are weighed, makes plain to the general reader the meaning and uses of the Astronomical Ephemeris and the Nautical Almanac, describes the world's debt to astronomy, and the aspects of American astronomy, and reports what astronomers are doing.

These twenty-one papers deal with many of the best fruits of scientific research, and all is told in a style so simple and interesting that the discussions are certain to be fascinating even to those who are not much inclined to scientific reading. We may regard this book, abounding, as it does, with approved and significant information, as one of the best of the works whose purpose is the popularization of science.

A Scientific Geography. By Ellis W. Heaton. Book II. The British Isles, 142 pp., and 45 Maps and Diagrams. Book III. Europe. 154 pp., and 47 Maps and Diagrams. Ralph, Holland & Co., London, 1906. (Price, each, 1s. 6d.)

These are excellent little books, whose aim is, as the author says, to associate the leading facts of geography in such a way that they will not only be interestingly presented but also that some explanation of the facts will be afforded. The books are suggestive rather than exhaustive. The author insists throughout upon the use of maps and sketch maps, and he endeavours to impress facts and inter-relations by requesting the student to make or fill out maps and diagrams to illustrate the text. Thus he asks the student to fill in, on a map supplied in the book, the details necessary to complete a table dealing with the elevation, temperature, rainfall, and agriculture of the various districts of Great Britain. Such an exercise can hardly fail to bring home to the student the close inter-relations between these factors. Much stress is put upon the physical causes which lead to agricultural and industrial development. The treatment is fresh and interesting,

and teachers may derive many suggestions from these books. The work is to be published in six volumes, book I giving a broad treatment of the world; book IV, North America; V, Africa; and VI the British Empire.

Geographen-Kalender. In Verbindung mit vielen Fachgenossen herausgegeben von Dr. Hermann Haack. (Fifth year.) vii and 775 pp., 36 Maps, Portrait and Index. Justus Perthes, Gotha, 1907. (Price, \$1.50.)

This annual has become a necessity to all geographical workers. The issue for 1907 contains 112 more pages than that for 1906. The number of maps has increased from ten maps and twelve tables to thirty-six maps, all illustrating geographical progress and events. Access to all the information is facilitated in this edition by a systematic table of contents and a complete index to names and facts. The geographical chronicle has been greatly enlarged and the arrangement of the data by geographical location instead of chronologically is a desired improvement. The exploratory enterprises of the year are summarized in forty pages with references to the literature descriptive of each undertaking and illustrated by seventeen maps. The list of the literary output of 1906, including books, monographs, papers and maps, covers 105 pages. Obituary notices fill 16 pages and the address book 330 pages, undoubtedly the most complete list of living geographical workers that has appeared to this time. A complete set of the *Geographen-Kalender* on the desk of a geographical worker is a continuously useful literary help. The portrait of Dr. G. Dalla Vedova is accompanied by an account of his long geographical career.

Dictionnaire Manuel Illustré de Géographie. Par Albert Demangeon. vii and 860 pp., Illustrations. Librairie Armand Colin, Paris, 1907. (Price, 6 fr.)

A handy volume of concise geographical descriptions and definitions. It is partly gazetteer, as it contains, perhaps, all or most of the geographical place-names that are positively essential in a small reference book of the kind. It aims also to define the technical words or terms used in physical geography and the other earth studies, gives some of the most important facts about countries, cities, explorers, geographers, industrial products, cartography, including map projections, geodesy, etc. Covering so wide a field, the topics are necessarily treated with extreme brevity. There is apparently no attempt to give the same kinds of facts for each class of topics. The facts about Milan, for example, relate to its geographical position, communications, number of inhabitants, industries, altitude and temperature (maximum, minimum and annual mean). In the article on Chicago nothing is said about its altitude or temperature. Its commerce is emphasized, though that of Milan is not mentioned. A large part of the contents is unexceptionable, though the work contains its full share of the mistakes common to such reference books.

A Progressive Course of Comparative Geography. By P. H. L'Estrange. xii and 148 pp., 177 Pictures and Diagrams in the Text, and 172 Maps and Diagrams in Colour, with Index, forming a complete Atlas. George Philip & Son, London, 1906. (Price, 6s.)

A quarto text-book and atlas combined, like most of those used in American schools, prepared on an ingenious and original plan and intended for use in a

geographical course of six years. Each topic is divided into sections A, B and C. The student in the lowest classes studies only the parts of the book under the heading A. In two years he will reach the middle section, when he will review A and gain additional knowledge in the B section. When he has completed part B, he will take up the C or final section and, at the same time, review A and B.

The long series of maps is studied in the same way. The names on each map are printed in three different colours, and the students in section A learn the most important names, which are brown; those in B learn the blue names also, and those in C the names in brown, blue, and red. The scheme is systematically progressive, both in text and maps. The student is not permitted to forget what he has learned, if reviews will keep it in mind, and he is constantly adding to his stock of knowledge.

The method of developing the subject is practical and logical. The attention of the beginner is attracted first to the phenomena around him, and he is led to deduce from them the principles of geography in accordance with the approved theories of physical geographers. Thus the principles of geography are first examined and then they are applied to the home country (Great Britain coming first in this text-book), and finally to countries becoming gradually more and more unlike the home country.

Education rather than mere instruction is the end aimed at. The author desires to stimulate the reasoning faculty rather than the memory. In the hands of a good teacher this book, without doubt, can be effectively used as a means of intellectual training. The maps are excellent and very clearly illustrate the principles and facts given in the text. The numerous pictures and diagrams are accompanied by many notes and questions; and an unusual feature is the abundance of exercises. The pupil is required to study out the answers to many questions. He must find from the maps before him the solution of many problems. The book cannot be used to advantage if any of these exercises are neglected, as the text frequently depends upon the correct solution of the problems.

Geographical educators will be interested to see the practical results of using this text-book. There is only one point in which the work appears to be open to important criticism. In the A section the principles and facts are, of course, of a more elementary nature, but the author has not simplified his language, and in many places the young student may have difficulty in comprehending the text.

The Birth of the Nation. By Mrs. Roger A. Pryor. xvi + 352 Ill. 24.

The Macmillan Co., New York, 1907. (Price, \$1.75.)

Under this rather ambitious title Mrs. Pryor has given a very readable account of the settlement and the early years of the English colony at Jamestown, Virginia. Though in her treatment of the subject she has touched lightly or not at all upon the economic or political problems confronting the nation at its birth, the book has a more than ephemeral value.

In preparing to write a story which would give to the visitors at the Jamestown Exposition a concise account of the historical events which it commemorated, the author studied very carefully all the accessible copies of manuscripts written by the founders of the colony. In this way she gathered interesting material not only regarding the life of the colonists, but also regarding the family life of the Indians with whom they came in touch. So, for the first time, there have been brought together in one volume many entertaining facts about the Jamestown Indians.

The graphic description of their worship and their principal temple at Uttamussac on the Pamunkey, coupled with Mr. Dodge's weird illustration, makes quite a thrilling chapter. There are also word-pictures of Indian customs, which the author's imagination has filled out with much spirit.

Of course the "Pocahontas Myth," as some scientific historians call it, is treated at length; and by virtue of the facts cited, and Mrs. Pryor's enthusiastic faith in them, it drops, for us, its mythical cloak and emerges again as a very credible story. Next to Pocahontas our favorite hero, Capt. John Smith, stands out, notwithstanding all his faults, more admirable than ever. And the debt that the nation owes to his courage and power is marked in comparison with the sloth, incapacity, and jealousy of his fellow-colonists.

As a whole, the feminine spirit pervades the book too strongly to carry conviction as to theories and conclusions. But for the most part these are avoided, and facts only are presented, with directness and ease.

For the not too serious student of history the volume will be instructive and entertaining.

H. P. L.

Entwicklungsgeschichte der gegenwärtigen phanerogamen Flora und Pflanzendecke der oberrheinischen Tiefebene und ihrer Umgebung. Von Dr. August Schulz. 119 pp., 2 Maps. J. Engelhorn, Stuttgart, 1906. (Price, M. 6.40.)

This is number 3 of Vol. 16 of "Forschungen zur deutschen Landes- und Volkskunde." Dr. Schulz treats of the development of the present flowering plants in Germany, and especially in the middle Rhine basin; and of the immigration into middle Rhine territory of a number of phanerogamia and of the history of these plants after their settlement there.

Deutsch-Ostafrika. Wirtschaftlich Dargestellt. Von Dr. Hermann Paasche. 430 pp. and 18 half-tone Illustrations. C. A. Schwetschke & Son, Berlin, 1906. (Price, M. 8.)

Dr. Paasche, formerly a university professor, with economics as his specialty, more recently Vice-President of the German Reichstag, decided to go to German East Africa and to base his conclusions as to the value of the colony, in part at least, upon his own independent observations. This book tells what he saw and heard and gives the opinions he deduced from his first-hand study. He travelled in the interior only as far as the mountain zone that borders the coastal plain on the west, but what he saw in this region and the information he obtained from officials who are thoroughly familiar with the inland districts seem to have supplied him with all the data required for his purposes.

Dr. Paasche deals in a pregnant manner with the present aspects and conditions of the colony. The first four chapters are given to a discussion of the general colonial question, and his observations during the trip to Africa on the Suez Canal, Aden and the British port of Mombasa. In the next twelve chapters he treats the regions in German East Africa which he visited, keeping right to the heart of the inquiries his journey was meant to facilitate. What is the present and prospective value of the ports of Tanga, Dar-es-Salam, Bagamoyo, and Pangani? The prospects of commerce, of colonial planting and railroad development, the qualities of the soils, the health conditions, the practicability of German immigration, the biological and agricultural experiment stations, etc.,

are topics of searching discussion. The following eight chapters deal in greater detail with the most important phases of agricultural production, now emerging from the stage of experimentation—the planting and preparation for market of sisal hemp (henequen), rubber, coffee, cotton, sugar, cocoanuts, oil grains and fruits, dye-stuffs, and timber. The final chapters relate to the settlement of German peasants on small holdings, the land question, and a summary of the conclusions which the author has enunciated and discussed in treating the various topics of the book.

Dr. Paasche returned to Germany in the firm belief that in German East Africa the Empire has a colony of vast potentialities, and that the work of development is worthy of liberal support. The long period of tentative effort and experimentation is about over and the beginning of the harvest is at hand. The freight offered for shipment at Tanga already surpasses the shipping facilities afforded. Within five years the exports of henequen alone will probably be at least 40,000 tons a year, and rubber, coffee, and other plantations are developing with remarkable rapidity. The Government should be prepared to encourage and promote this progress.

The opinion is universal among officials and settlers that the highlands of western Usambara, the high grass plains west of the Mara River and those between Mount Kilimanjaro and Victoria Nyanza, are perfectly adapted for cattle-raising and agriculture, and that, in the course of development, very large numbers of German peasants may settle in these districts under favourable conditions and live there in more comfortable circumstances than they are able to do in Germany.

It is not long since an unfavourable opinion was common as to the future of this colony. The events of the past three or four years had done much to disprove this view and pave the way for Dr. Paasche's book, which unqualifiedly certifies to the great value of this possession while criticizing, in some respects, the colonial policy of the Government.

A Woman's Journey through the Philippines. By Florence Kimball Russel. Ill. 40. L. C. Page and Co., Boston, 1907.

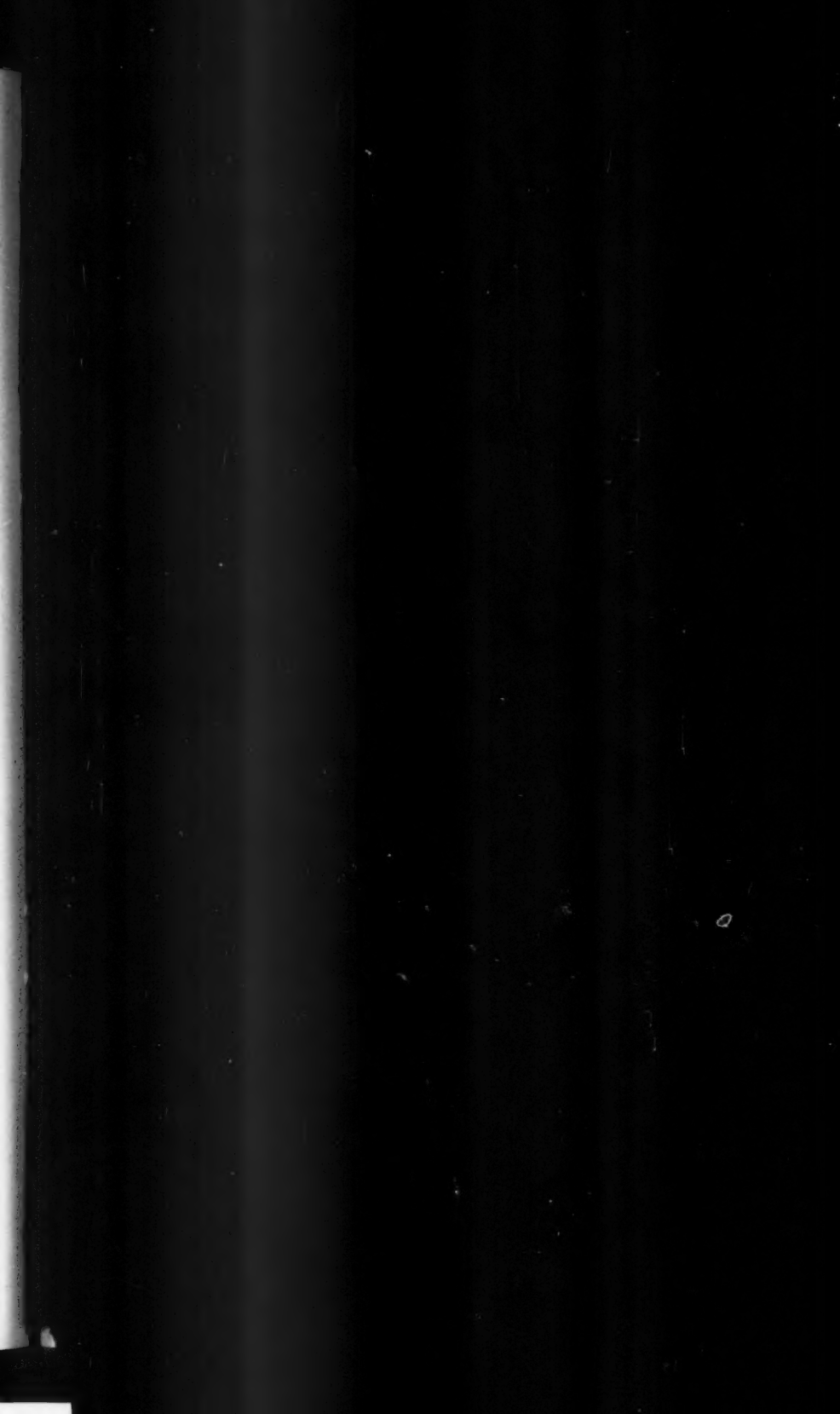
This light sketch of the Philippines is given by the wife of a Signal Corps officer, who accompanied her husband on the steamer *Burnside* during its three months' cable-laying cruise among the Islands. It adds nothing of importance, though something of interest, to our knowledge of the Philippines.

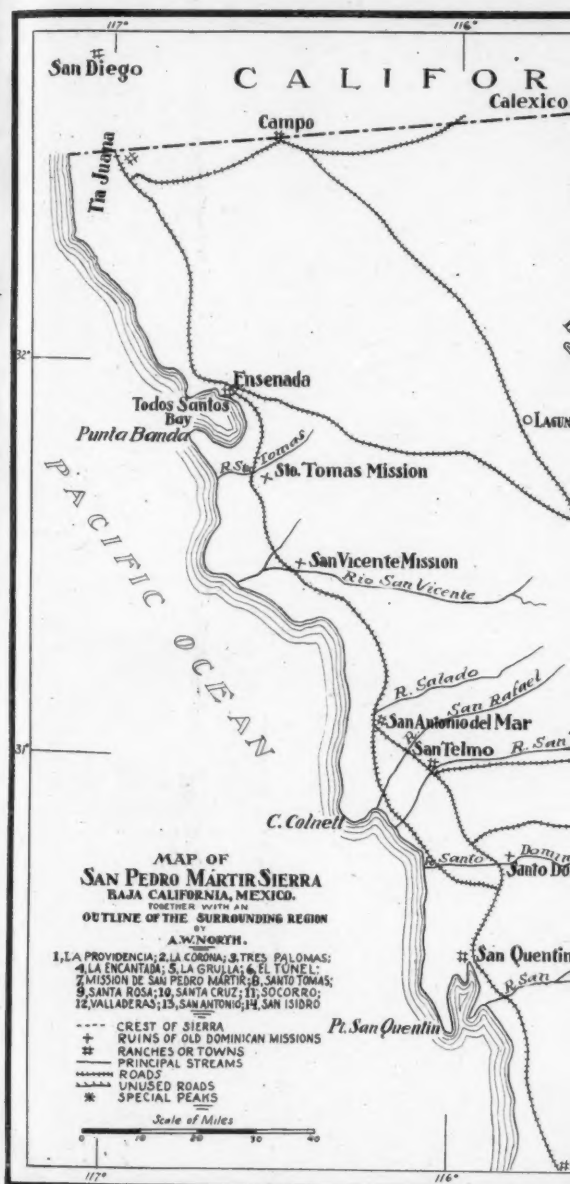
It was evidently a young and happy circle that spent its leisure hours on the quarter deck of the *Burnside*, or on drives or social pleasures on the various Islands. Whatever struck the author as interesting in this obviously superficial view—the dress or undress of the natives, their homes, and personal appearance—is set down with a certain facility of expression. The few political opinions ventured are evidently acquired from the Signal Corps officers in the employ of the Government.

Though of no value from a scientific standpoint, this little volume leaves a pleasant impression of blue seas and bluer skies, stately palms and picturesque nipa shacks, soldierly Americans and friendly savages.

Its pretty illustrations and gay spirit will serve to entertain some to whom the Philippine Problem is of no interest.

H. P. L.





Map to accompany the article on The Uncharted S
in BULLETIN for Sept

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